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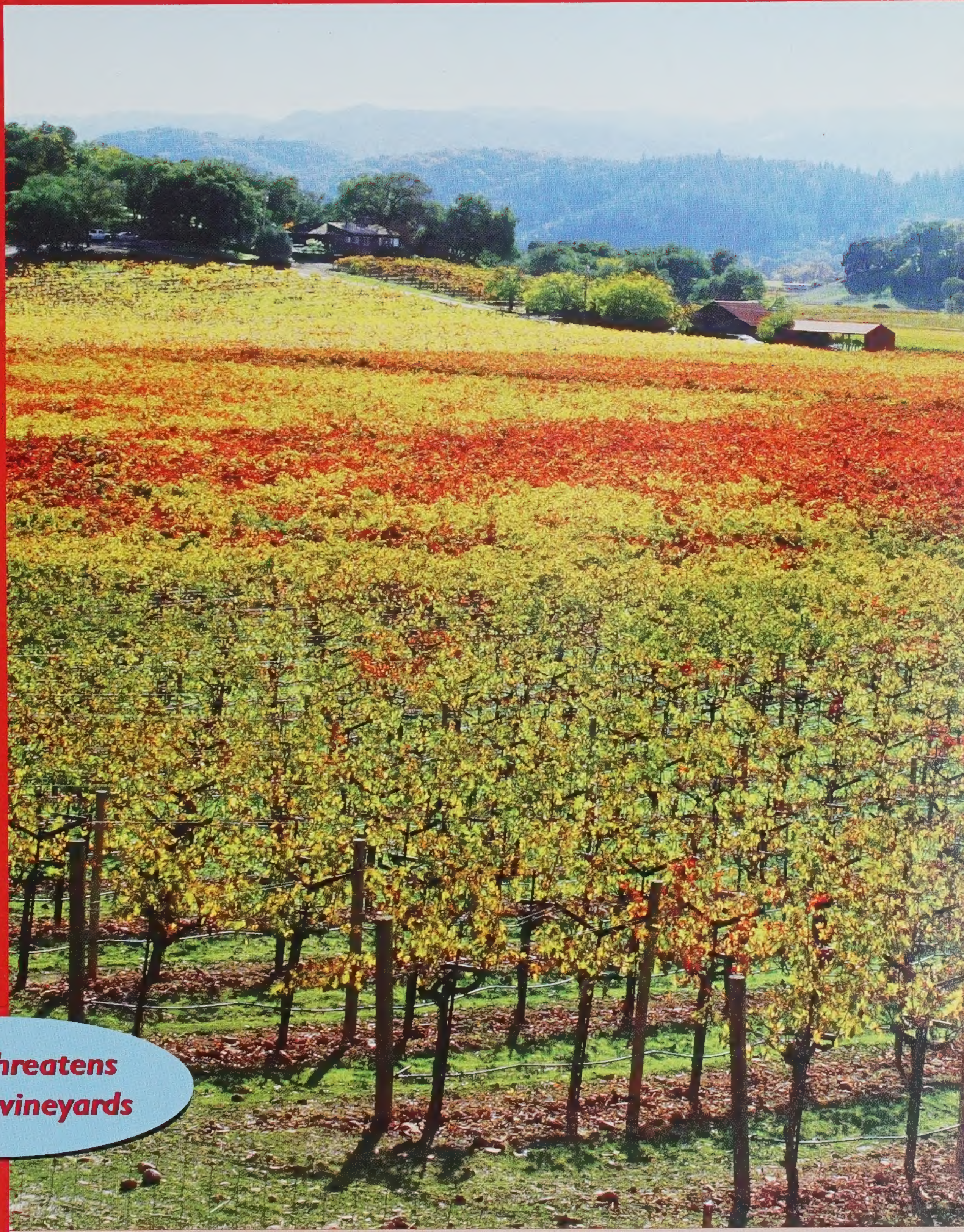

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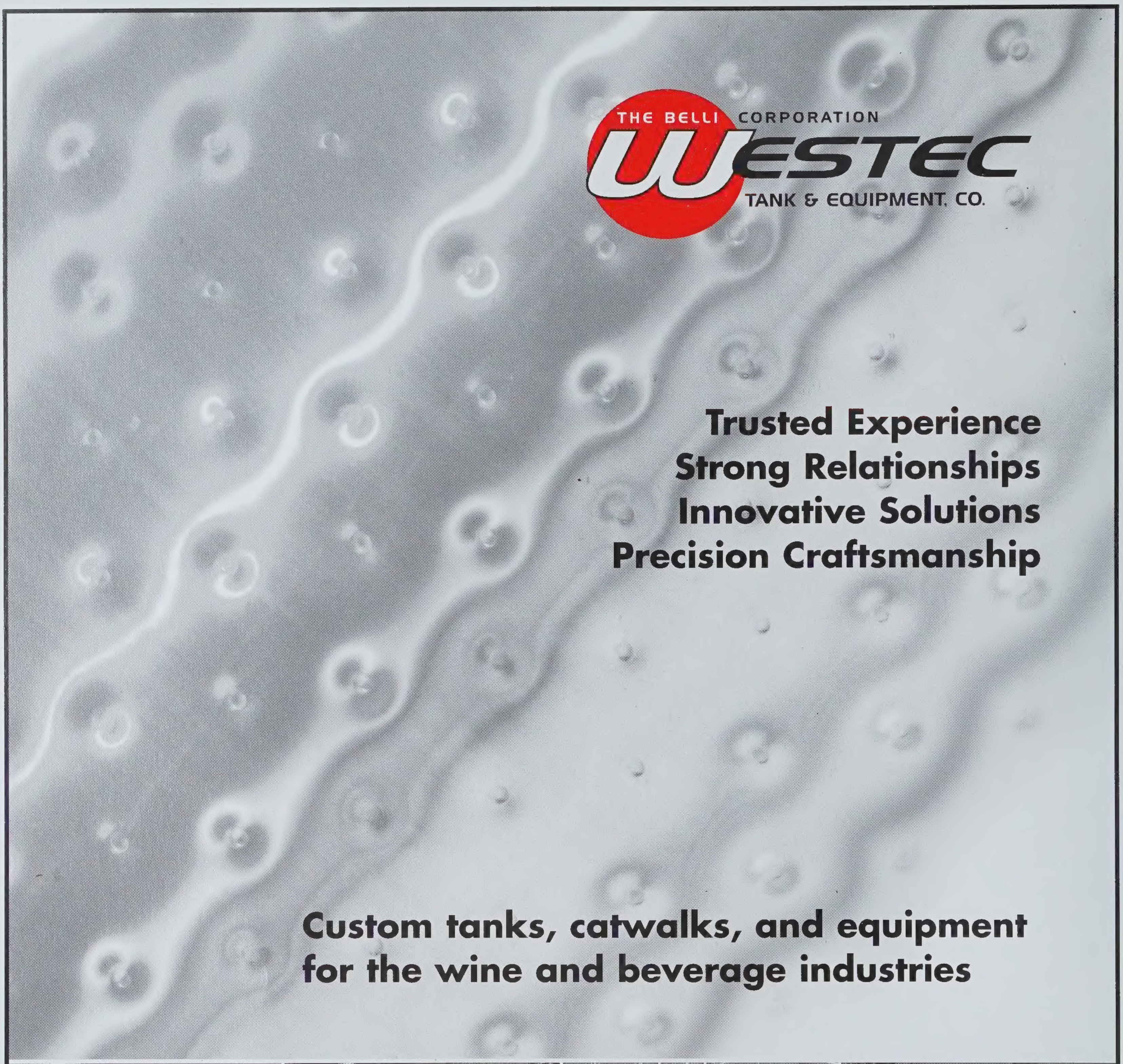

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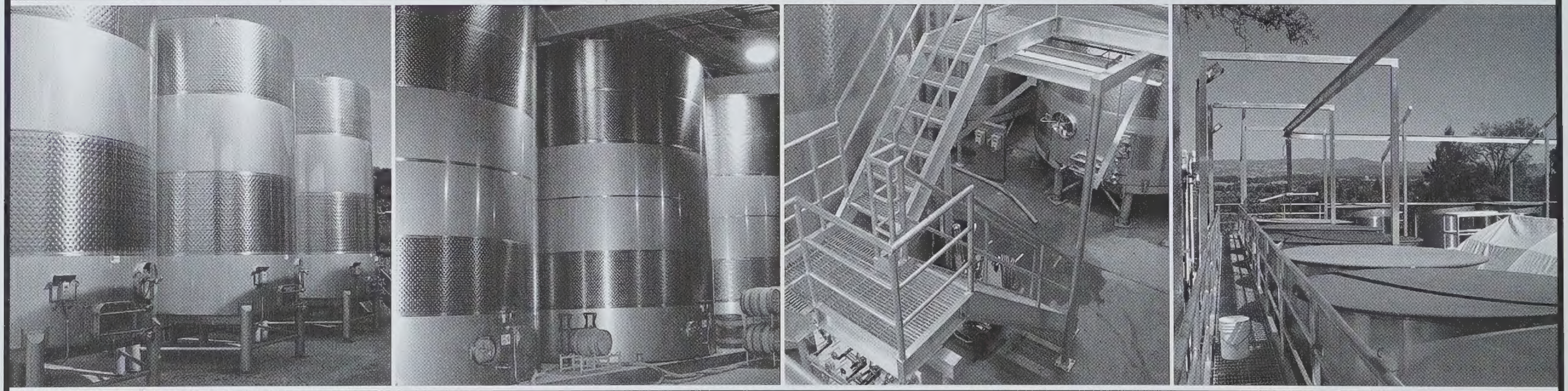

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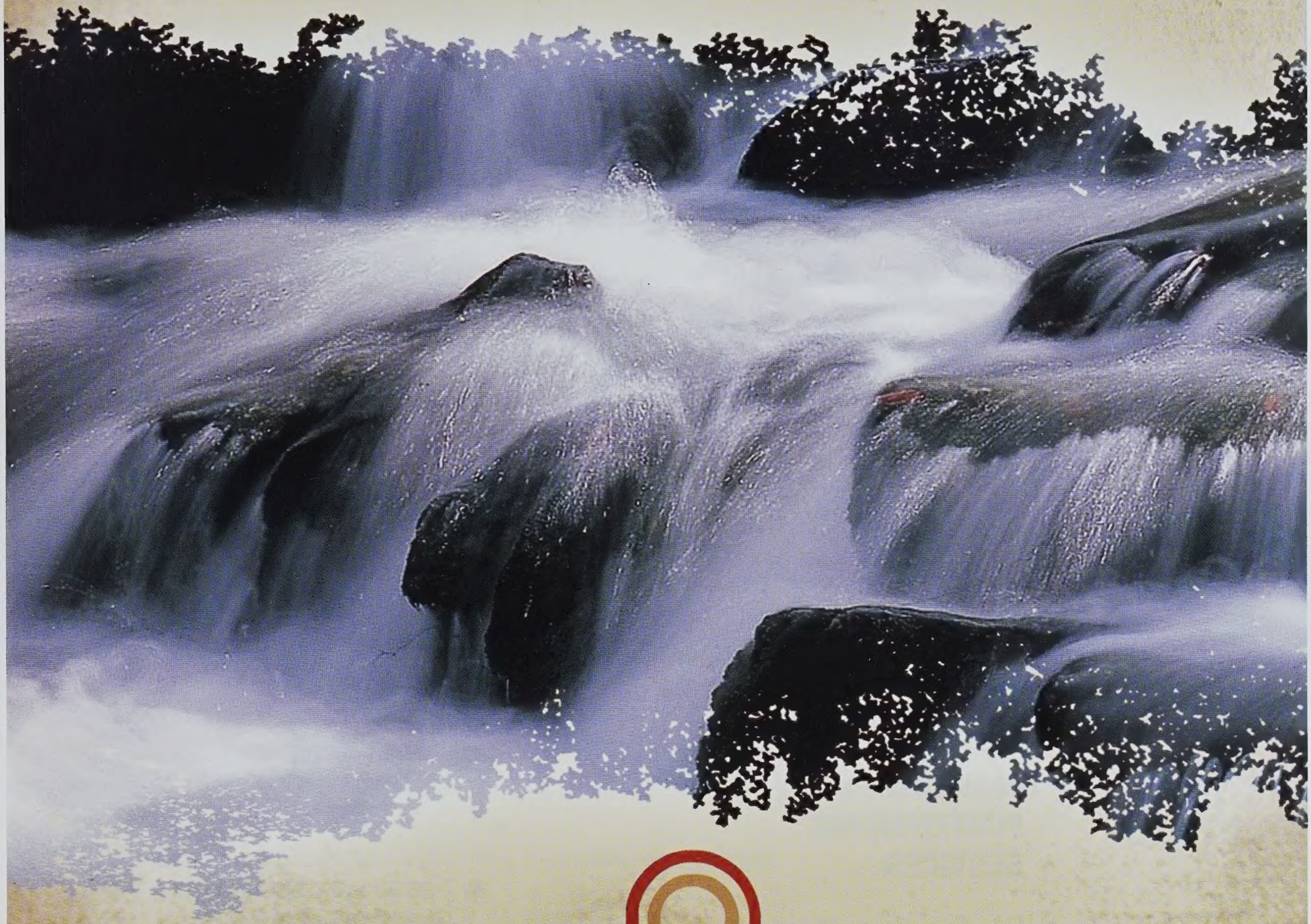

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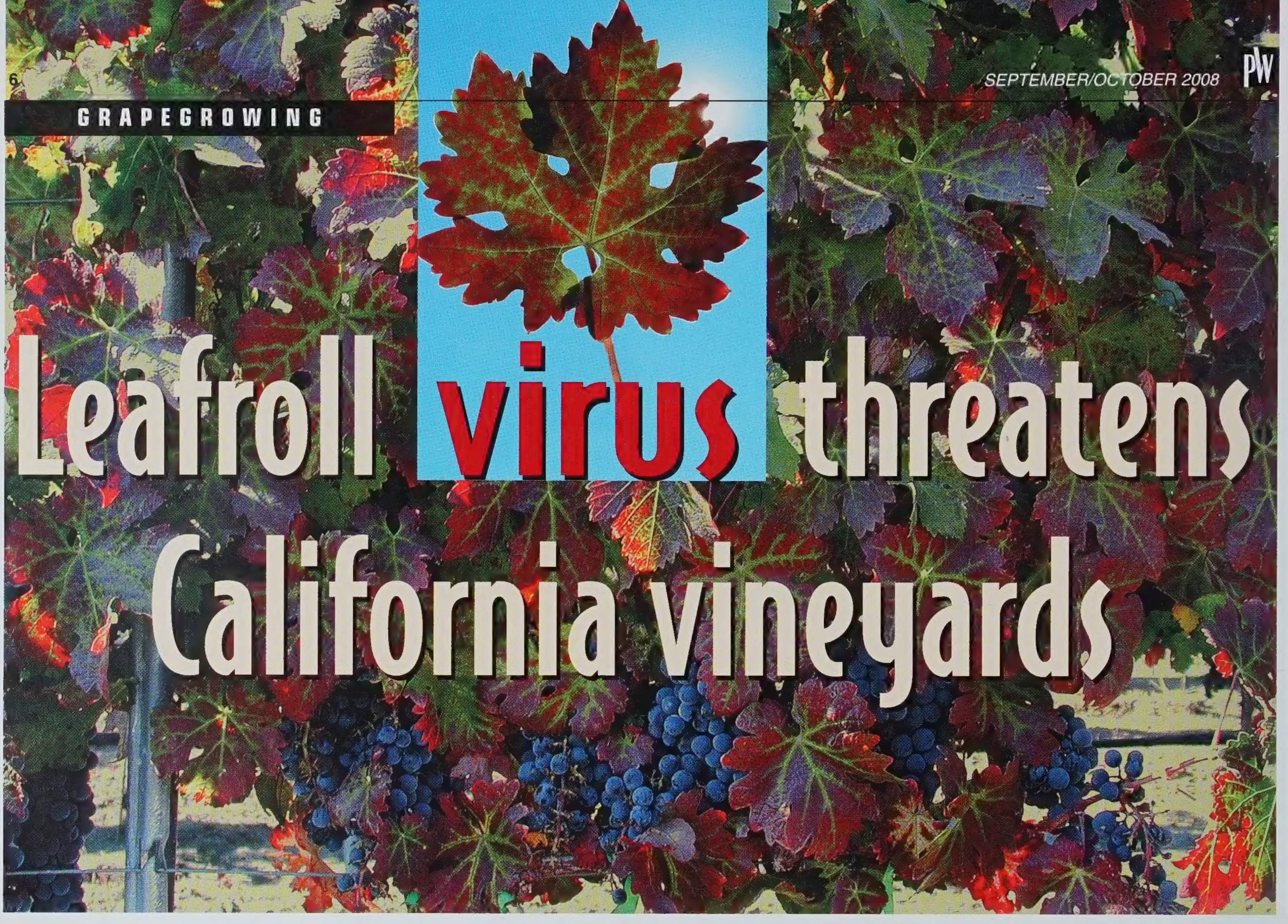
GRAPEGROWING

Leafroll virus threatens California vineyards



Leafroll trials at Oakville, CA demonstrate red leaf symptoms, poor fruit color and quality, and reduced yields.
All photos courtesy, Foundation Plant Services unless otherwise noted.
INSET: Leafroll symptoms can sometimes be confused with nutrient deficiency. Holding a suspect leaf to the light can be diagnostic — the clear red shown is a strong sign that leafroll is present.

BY Nancy Sweet,
Foundation Plant Services,
University of California, Davis

A recent example of leafroll spread in a Napa Valley vineyard illustrates how quickly the debilitating virus could enter a vineyard and cause serious damage. Leafroll virus poses a significant threat to the California grape industry due to reductions in tonnage and fruit quality and the need for frequent vineyard replanting.

Grapevine leafroll virus most likely originated in the Eastern Mediterranean region long ago and co-evolved with *Vitis vinifera*, later spreading throughout the world by the movement of infected vines and cuttings.[15] Symptoms of leafroll disease were observed in California in the early 20th century, but the disease remained unrecognized or unimportant for decades. Loss of AXR-1 rootstock due to phylloxera and development of powerful new virus detection technology in the 1990s raised the profile of the disease in California.

Leafroll virus

Grapevine leafroll virus is a member of the ancient and diverse virus family *Closteroviridae*, which can be transmitted by phloem-feeding insect vectors such as aphid, mealybug, and whitefly.[9,12] There are currently eight serologically distinct, closely related viruses associated with grapevine leafroll disease. Each of the eight viruses has a unique RNA sequence, so much so that the viruses are distinct species rather than simply separate strains of the same virus.

The family *Closteroviridae* was revised in 2002. Grapevine leafroll-associated virus 2 (GLRaV-2) is located in the genus *Closterovirus*. The *Ampelovirus* genus was added to the family in 2002. *Ampelos* is the Greek word for grapevine. Grapevine leafroll-associated viruses (GLRaV) 1, 3, and 5 are separate, mealybug-transmitted species located within the new genus, and GLRaV-4, 6, and 9 are tentative species within *Ampelovirus*.[1,3,10] More molecular data is needed before GLRaV-7 can be assigned to a genus.[10,11]

Leaf and fruit symptoms can be used to diagnose leafroll disease in some varieties of *Vitis vinifera* grapevines.* Visual symptoms develop as the crop matures. Leafroll virus symptoms that occur on infected vines resemble nutritional deficiencies and premature senescence, which can make them difficult to diagnose by visual inspection, particularly in the early years of infection.[9]

Leafroll disease causes degeneration of primary phloem cells in young shoots, leaves, and fruit pedicels.[15] In woody perennials such as grapevines, the virus may cause problems in vascular tissue development manifested by leaf-rolling, stem-pitting, stunting, reduced vigor, and reduced quantity and quality of the harvested fruit.[9]

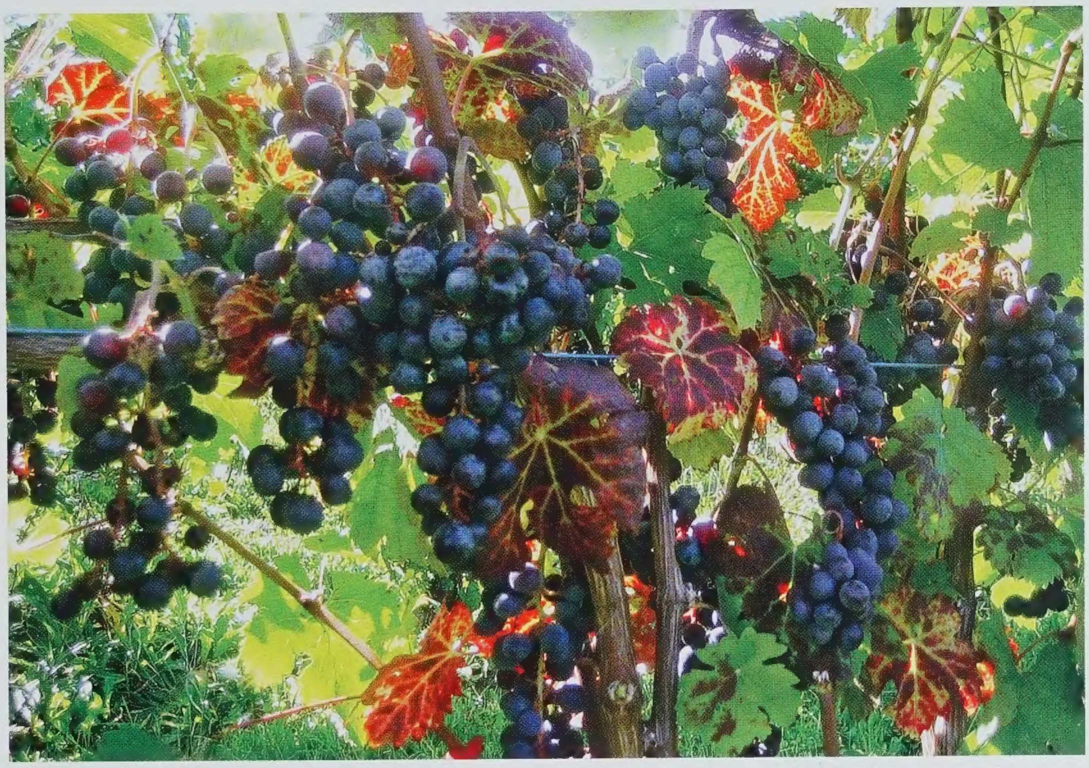
---

* Unlike the situation with V. vinifera grapevines and grapes, visual symptoms are not reliable as an indicator of leafroll disease in most North American species and hybrids, including most rootstock varieties.

The presence of leafroll virus is often indicated by physical symptoms on leaves resulting from the impaired vascular tissue. The most distinctive leaf symptoms appear between the time of harvest and leaf drop. However, knowledgeable growers can sometimes see mild symptoms as early as June.

The margins of the leaf blades roll downward starting with the basal leaf on the cane of an affected vine. The area between the major veins turns yellow or red, depending on whether the variety produces white- or red-colored fruit. In some varieties, the area adjacent to the major veins remains green until late fall.[7] It is more difficult to detect leafroll virus from a visual examination of white grape varieties than it is with red grape varieties.

The most significant effect of leafroll disease on grapevines is a reduction in yield and quality of fruit from infected vines. The damage to phloem tissue



Leafroll-affected vitis vinifera cv. Cabernet Franc with leaf cupping and reddening, and reduced fruit set. Photo by Marc Fuchs, Cornell Plant Pathology Department, New York.

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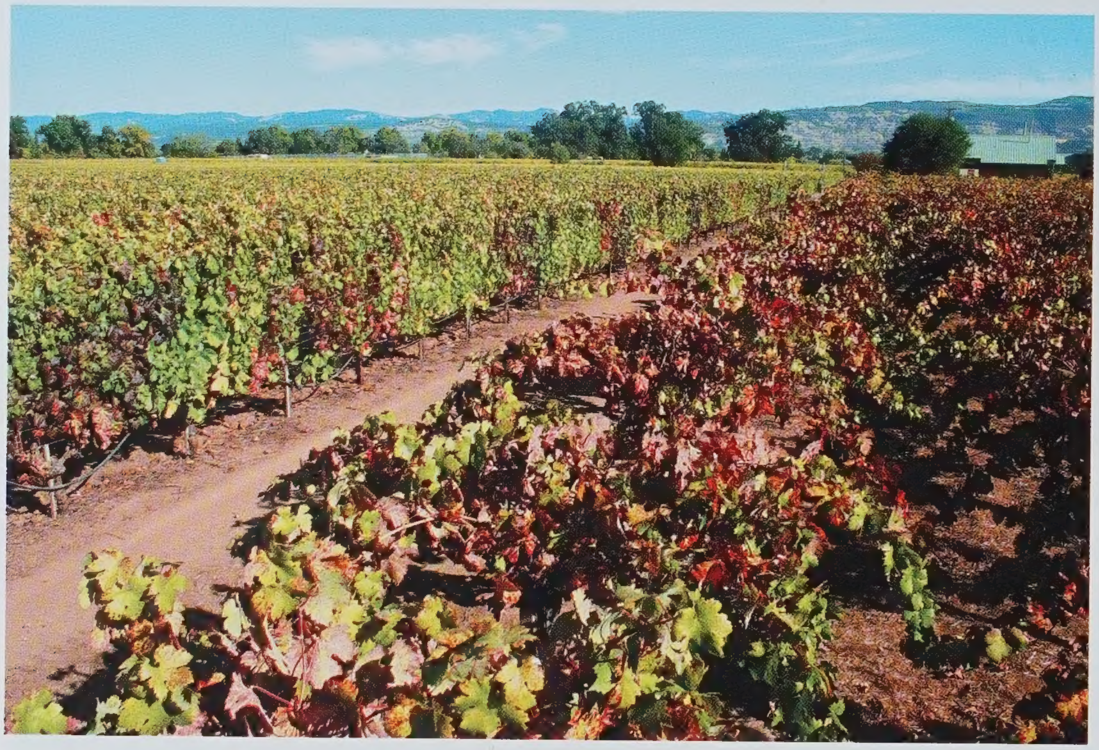

Leafroll virus frequently spreads from an older vineyard block (see old, infected Zinfandel, foreground) to a young, healthy one (Merlot in the younger block, background).

caused by the virus results in delayed sugar accumulation and reduced anthocyanin production in red varieties.

Fruit from infected vines will be low in sugar, poorly colored, and late in ripening. In some varieties, fruit maturity is delayed so that fruit on the affected vine may be pale or even whitish at harvest when fruit on healthy vines is ripe.[7] Annual pruning weights, cluster number, and cluster size are all reduced on infected vines.[15]

The lack of symptoms in any type of grapevine does not guarantee freedom from infection by the viruses that are the causal agents of leafroll disease.[15] Leafroll viruses have been historically difficult to study because they are at low titers in grapevines, the viruses have only limited (if any) alternate hosts, and it is extremely difficult to purify intact virus particles from grape plant tissue. Recent developments in laboratory techniques have addressed some of these challenges, and tremen-

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dous progress has been made in the last decade studying these viruses.

Leafroll infestation in a vineyard usually does not kill the vines in the first few years — however, significant losses can occur in the form of reduced yield and quality over time as leafroll spreads throughout a vineyard.[7] Yield losses of 10% to 20% are fairly typical.[15] Some studies have estimated losses as high as 30% to 40%.[6] Vine death occurs most often when leafroll disease is combined with other virus diseases, according to Deborah Golino (Director, Foundation Plan Services).

Viruses are particularly insidious because an infected vine will never recover from the disease — no curative measures are available. Prevention is the key management strategy for grapevine leafroll virus. Vineyards must be maintained in a virus-free condition in order to avoid damage caused by the disease.[7]

Mechanism for spread

Discovery of leafroll disease in an FPS block in 1992 focused attention acutely on the mechanism for leafroll virus spread in California vineyards. The FPS clean stock program was originally managed under the assumption that grapevine leafroll viruses spread only by grafting healthy stock with infected stock and did not spread naturally in vineyards.[5,6]

In the 1980s and early 1990s, researchers outside of California had begun to observe a natural spread of leafroll disease in vineyards, which those researchers attributed to mealybug vectors.[6,12] No evidence of such spread had been documented in the U.S. prior to 1992.[16]

Prior to the discovery of leafroll virus in the FPS vineyard in 1992, only three species of mealybugs were commonly found in California vineyards — the grape mealybug, *Pseudococcus maritimus* (North Coast, Central Coast, and San Joaquin Valley), and the obscure (*Pseudococcus viburni*) and longtailed (*Pseudococcus longispinus*) mealybug (Central Coast). The low population levels of these mealybugs and effective biological and chemical controls had kept the infestations at a manageable level.

The finding of leafroll virus in the FPS Foundation Vineyard prompted a study conducted between 1992 and 2001. When distribution of infected plants in the FPS Foundation Vineyard was mapped, it became apparent that new infections were frequently found adjacent to known diseased grapevines. FPS researchers identified mealybugs as the putative leafroll vector and structured a research project on that theory.

The results of the research confirmed that four mealybug species found in California — obscure, longtailed, citrus (*Planococcus citri*), and

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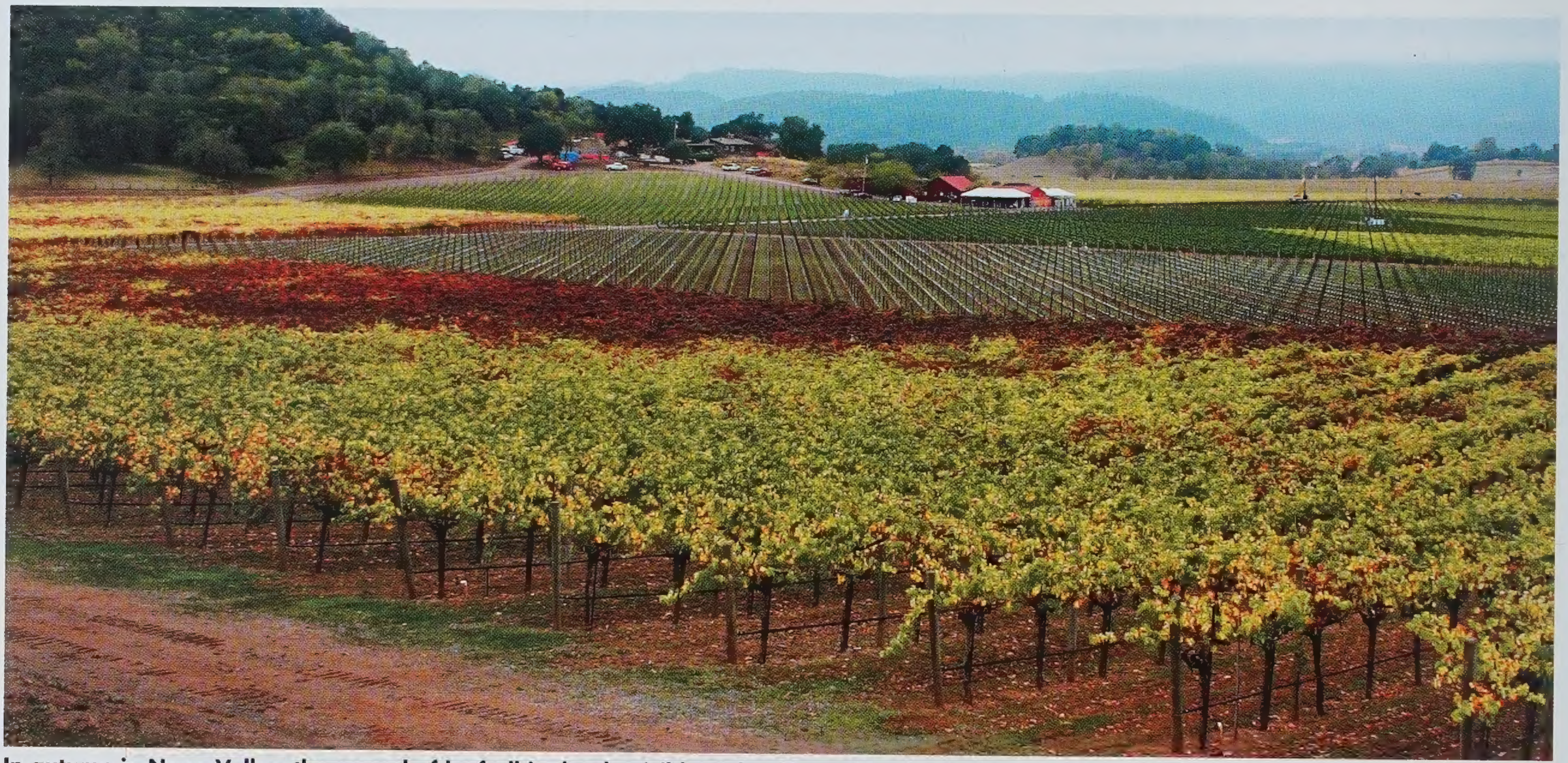

In autumn in Napa Valley, the spread of leafroll is clearly visible as healthy golden leaf color is replaced by the bright red leaf color of diseased vines.

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grape — were capable of transmitting domestic isolates of grapevine leafroll-associated virus-3. It was the first experimental evidence of GLRaV transmission by obscure and grape mealybug, which had been collected for the study from Napa Valley. The study further reported for the first time that GLRaV-5 can be transmitted by longtailed mealybug.[6]

The vine mealybug (*Planococcus ficus*) was not included in the study. VMB first appeared in table grape vineyards in the Coachella Valley (California) in the early 1990s but did not appear in northern and central California vineyards until approximately 2000.[13]

FPS responded to the study findings by increasing isolation distances and implementing a comprehensive virus-screening program using the ELISA test and newly developed PCR technology.[6]

Napa Valley study: 2002–2006

A vineyard located in Napa Valley illustrates the devastating effect that the unchecked spread of leafroll virus can have on a grape crop.

A 7.2-acre parcel in a vineyard near Oakville in Napa Valley (referred to here as Block 1) was planted in 1989 with Cabernet Sauvignon wood on several rootstocks (110-R, 3309-C, and Teleki 5C). Vine rows were oriented in an east-west direction, with six feet between rows and 3.3 feet between vines.

The Cabernet Sauvignon wood was believed to be clean, based on the lack of symptoms in the block from which the budwood was collected. The source of the budwood is uncertain. No leafroll virus symptoms were observed on the vines in the first nine to 10 years after planting, suggesting that the original stock was free of virus. Leafroll symptoms began to appear as described below in 2000.

Vines in the experimental site abutted a dirt road that ran along the eastern end of Block 1. A second block of Cabernet Sauvignon vines, known as Block 2, was growing across the road from Block 1. Block 2 had been planted in 1970–1972 and was heavily infested with grapevine leafroll virus, evidenced by red leaf symptoms throughout Block 2.

When Block 1 was installed in 1989, the assumption was that leafroll virus was spread by propagative techniques and not by insect vectors.** The characteristic red leaves caused by leafroll virus on red grape varieties began to appear on the Cabernet Sauvignon vines in Block 1 in 2000, concentrated primarily at the eastern end of the block.

** The vines in Block 2 were removed in 1994, and the field was replanted in 1998.

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Deborah Golino (FPS Director) and Ed Weber (former UC Extension Farm Advisor-Napa County) were doing fieldwork at virus sites in Napa in the fall of 2002 when a research viticulturist at a winery in the Oakville area called their attention to Block 1, where the spread of leafroll virus was observed. Golino and Weber began to map the incidence and pattern of vines with symptoms of leafroll virus in Block 1, beginning in the fall of 2002.

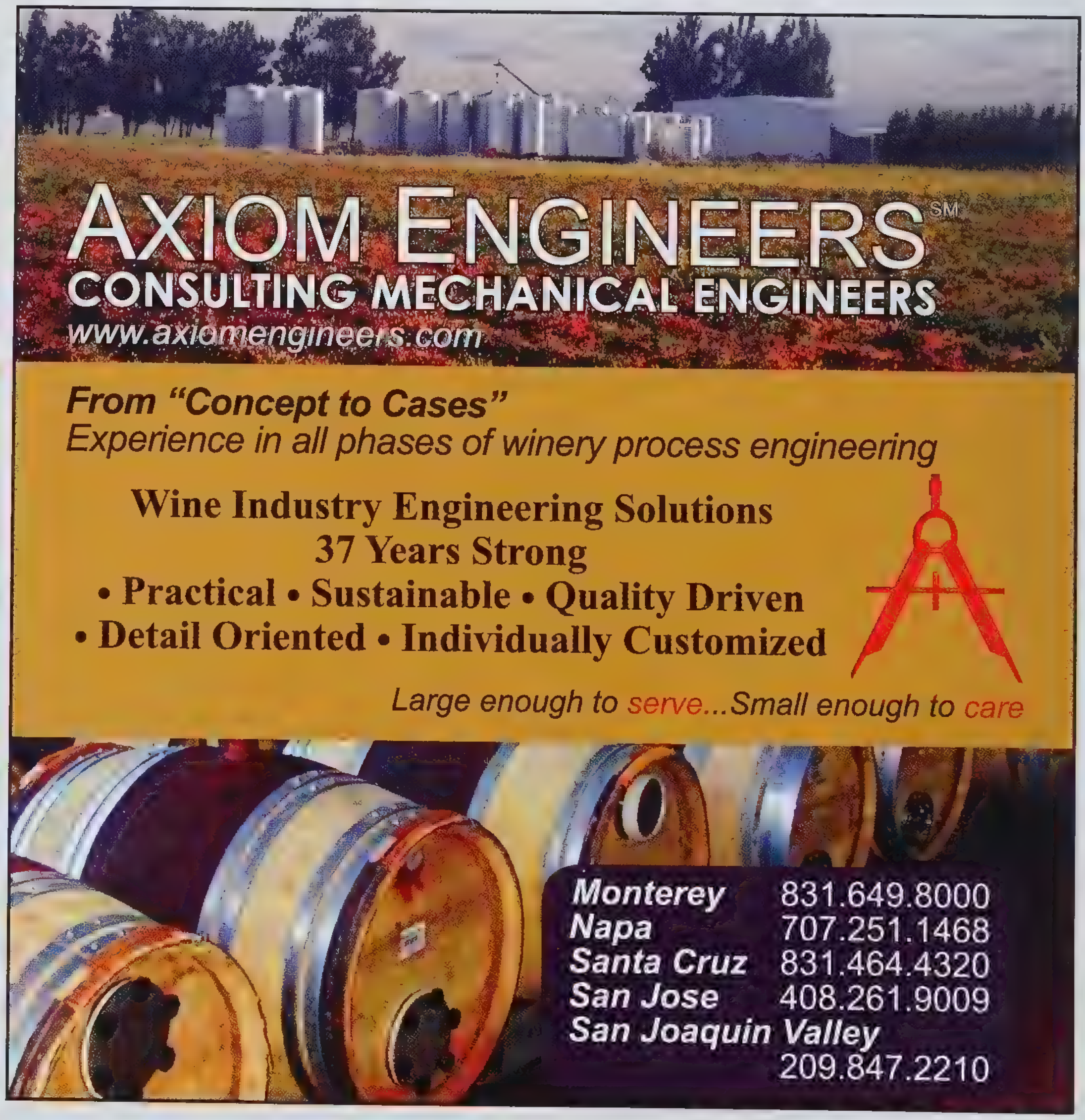
Mapping methodology

The goal of the mapping project was to make a visual assessment of leafroll spread throughout the block by observing all of the vines for several years. Leafroll-positive Cabernet Sauvignon vines normally produce strong, characteristic visual symptoms. The documented observations comprise a precise record of the presence of the virus. The project team, led by Weber and Yvonne Rasmussen (UC Extension) and Sue Sim (FPS), made observations on all vines in Block 1 in 2002, 2003, 2004, 2005, and 2006.

Block 1 consisted of 98 vine rows containing approximately 15,680 vines. In 2002, each vine in Block 1 was rated individually for symptoms of leafroll disease, using the following scoring template: 0 = no symptoms; 1 = mild or severe symptoms; Q = questionable (difficult to determine whether virus was present, usually because of mite feeding); C = canker symptoms masked possible leafroll symptoms; and X = a dead or missing vine.

In the first year of the mapping study, the scoring protocol was assessed for accuracy by comparison of the visual ratings with lab test results on a subset of Block 1 vines.

Seventy-five petiole samples were ELISA tested for GLRaV-1, 2, 3, and 4.[14] Thirty-five of the 75 samples were from vines that had been rated positive (1) for the presence of leafroll, 20 were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from vines with no leafroll symptoms (0), and 20 samples were from vines rated questionable for leafroll virus (Q).

The accuracy assessment showed that the visual observations of symptoms were highly correlated with the lab results showing the presence of virus. Although not in perfect agreement with the lab results, the visual symptom ratings were very accurate.

All 35 samples from vines visually rated as positive (1) for leafroll were also positive for GLRaV-3 by ELISA testing. ELISA test results showed only GLRaV-3 in the samples from symptomatic vines; the tests were negative for the other three GLRaV viruses.

All vines rated as Q (questionable) tested negative for leafroll virus. However, of the vines that exhibited no symptoms in the field (0), two of the 20 samples (10%) tested positive for GLRaV-3.

Researchers concluded that the two positive ELISA tests on asymptomatic vines suggested infected vines that had not yet begun to show symptoms. The high correlation rate for visual rating vis-à-vis ELISA test results led researchers to conclude that the visual assessment method was credible for use in the large-scale mapping project.

In the fall of 2007, lab tests were repeated on 204 vines. The results again showed that the visual symptom ratings were very accurate. 100 of the 101 vines that were rated positive on the basis of visual symptoms tested positive for GLRaV-3 using ELISA testing. 100 of 103 vines that were rated negative on the basis of visual symptoms tested negative for GLRaV-3 on the basis of ELISA testing.

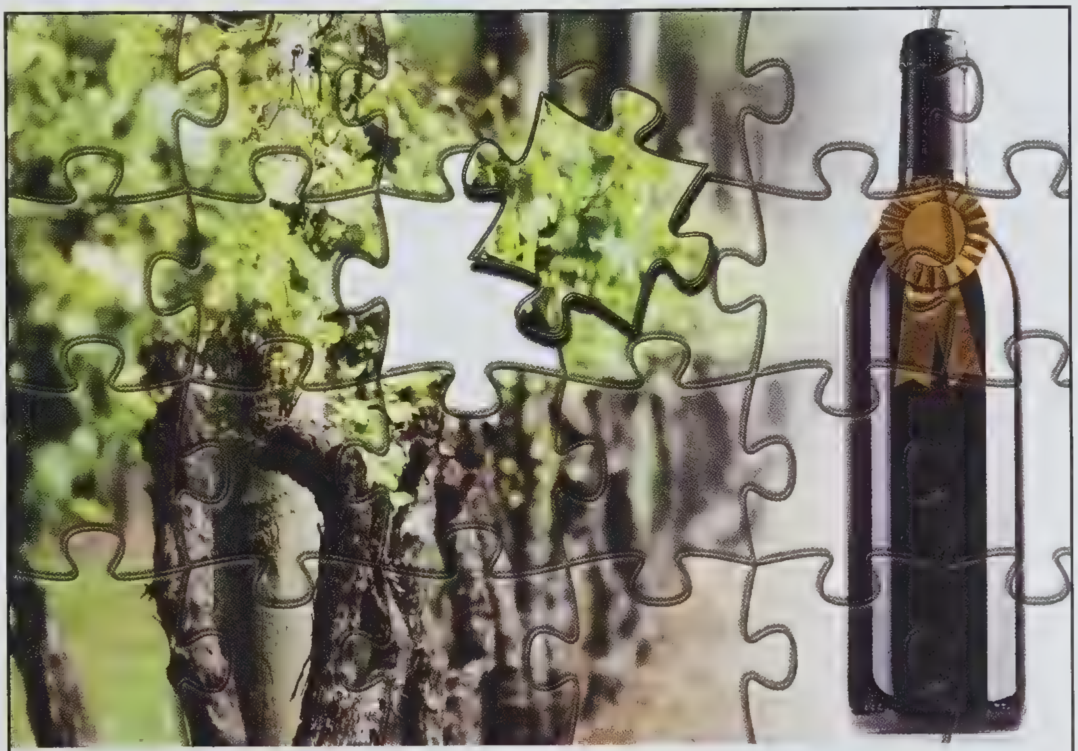
The researchers again concluded that it was probable that the three vines that tested positive from asymptomatic vines represented early stage leafroll infection where symptoms were mild or where there were not yet any visible symptoms.

The rating system was amended after review of the results from the 2002 accuracy assessment. In 2003 and after, each vine was scored in one of three categories: positive for leafroll symptoms (1); negative for leafroll symptoms (0); or dead or missing (X). The questionable (Q) and canker (C) categories were eliminated.

Results

2002 — The mapping results from 2002 show that leafroll symptoms were present in 23.3% of the vines in Block 1. Nearly all vines on the eastern end of the rows were rated positive for leafroll disease, and only a few vines on the western end were positive.

There was a clear distribution pattern of symptomatic vines throughout the vineyard, suggesting that the leafroll virus originated from a vineyard (Block 2) located across the road



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that runs along the eastern end of Block 1. The supposition is that leafroll virus from that older vineyard initially crossed the road and continued to spread westerly down the rows of Block 1.

2003 — The percentage of symptomatic vines in Block 1 increased to 41.2% by the fall of 2003. The pattern of diseased vines continued to demonstrate spread from east to west within the vineyard. Leafroll symptoms were also observed at this time on the vines (1998 planting) in Block 2, indicating that the virus had returned to the vineyard across the eastern road.

2004 — In 2004, 45.8% of the vines in Block 1 suffered from leafroll disease. By that time, grapes from healthy and diseased vines differed so greatly in fruit quality and ripening patterns that the vineyard was harvested twice. Grapes from healthy vines ripened two weeks earlier and exhibited better quality than grapes from diseased vines. The better quality fruit was picked several weeks ahead of the diseased vines and incorporated into reserve wine at the winery. Grapes from diseased vines fell below the standard for inclusion in reserve wines.

2005 / 2006 — Leafroll virus infected more than a majority of the vines in Block 1 within the following two years. The percentage of symptomatic vines increased to 49.8% in 2005 and then to 66.1% in 2006. At present, the quality of the fruit from the diseased vines continues to be inferior. The owner is now faced with the need to replant the block after only 15 years due to the pervasive negative influence of the leafroll virus.

In the year after the final observations were made, FPS researchers began extensive laboratory testing of the affected vines from Block 1 using current PCR methodology and primers to enable detection of new virus types identified since 2002.

The researchers did conclude that the grape mealybug was the most likely vector for the spread of leafroll disease in the Napa vineyard. Grape mealybug had been observed in Blocks 1 and 2 and surrounding vineyards for many years, but the vector was usually present at low population levels that were deemed not to be a threat to vines. The risk of leafroll spread from such small populations had not previously been a consideration when assessing potential damage from grape mealybug.

In much of Napa Valley, similar low population levels of grape mealybug have been regularly observed but have not been problematic due to biological controls and insecticides. Nevertheless, researchers in this study strongly suspect that grape mealybug was responsible for transmitting GLRaV-3 from Block 2 to Block 1 and for spreading the virus throughout Block 1.

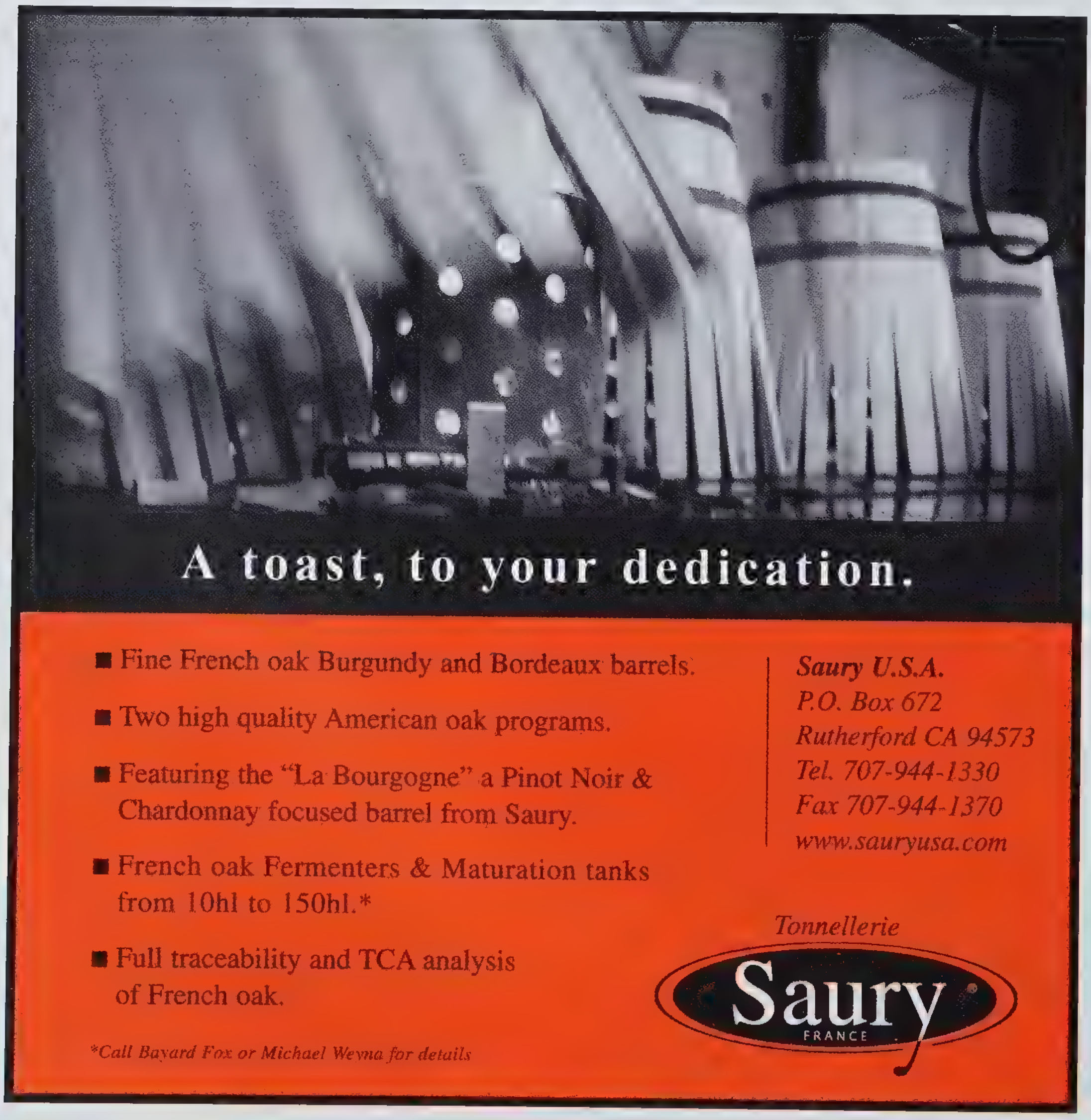
Golino comments on the research findings: "The results of this mapping study constitute the first documentation of significant and rapid field spread of leafroll disease in a California vineyard."

Concerns for the future

Vineyards in other parts of Napa Valley have shown signs of leafroll spread at rates similar to those documented in this study. Growers' concerns have been heightened by the recent discovery in California of the vine mealybug, a vector that could substantially aggravate the spread of leafroll virus in Napa Valley and elsewhere.

The fact that the rapid spread of leafroll virus was never observed despite the presence of excellent researchers and observant vineyard managers suggests that something fundamental has changed in the vineyard environment. Several causative factors for the increased rate of spread have been proposed.

The first possibility considered is a new leafroll vector or changing vector populations. Grape mealybug has been present in Napa Valley for many years and was present in all vineyards where rapid spread of leafroll virus occurred.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However, there is no evidence to suggest that grape mealybug population levels have increased, either in response to changing vineyard management strategies or any other circumstance. Vine mealybug is not established at this time in the locations where leafroll spread has been observed.

Vine mealybug (VMB) is a relatively new and dangerous threat in terms of the spread of leafroll virus in California vineyards. VMB spread from the Coachella Valley in southern California to the southern San Joaquin Valley in the late 1990s and to Central Coast vineyards in 2000 and 2001. The pest first appeared in Sacramento, Sonoma, and Napa counties in mid-2002.

The first reported case of vine mealybug infestation in Napa County occurred when the insect was found in two vineyards near St. Helena.[8,13] VMB has since been controlled by extensive efforts.

Vine mealybug may present a more serious threat to California vineyards than other mealybugs for several reasons. VMB is difficult to control and requires repeated insecticide treatments far exceeding that of other mealybugs. VMB has fewer natural enemies in California, where it is not native.[13]

VMB reproduces at a higher rate than other species, enabling small numbers of mealybugs to reach damaging levels in a single season. It produces as many as seven generations per year, and all life stages are present all year round due to overlapping generations. In comparison, the grape mealybug has only one or two generations per year.[8] Detection and identification can be a problem as VMB, like most mealybugs, hibernates in crevices and under the bark on the vine and cannot be confirmed with an ordinary hand lens.[2,8]

Although not yet observed in Napa Valley in significant numbers, proliferation of the vine mealybug population could facilitate rapid spread of viruses throughout vineyards of central and northern California.

International literature published in the 1980s was the first to report that vine mealybug could transmit leafroll virus. In South Africa, whose climate closely approximates that of California, leafroll disease spread quite rapidly due largely to the presence of vine mealybug.[15]

Expert pathologists expect that vine mealybug will be a very efficient vector of leafroll virus in California. Scientists at UC Davis and UC Berkeley are currently conducting research on the transmission biology of GLRaV-3 by the vine mealybug. Effective control (management) of this resilient pest before it can gain a foothold in northern California is critical.

Vector factor discounted

The bottom line for Napa growers, at this time, is that increased popula-

Continued on page 81

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ALBARIÑO

Spanish white gains U.S. foothold

BY Eleanor & Ray Heald
Contributing Editors

Consumers have become more experimental and are seeking change-of-pace varietal wines. Fitting this bill is Albariño, a thick-skinned aromatic white with racy acidity that commands 92% of vineyard acreage in the Rias Baixas D.O. of the Galicia region in northwest Spain.

In the Rias Baixas (granted D.O. status in 1988), Albariño, grown on granite and chalky soils, has adapted to the typically windy, cool, and rainy climatic conditions in this Atlantic Ocean coastal appellation. Vines are trained horizontally, open and high, allowing winds to dry them and thereby avoiding disease pressures such as mildew, rot, and a variety of fungal diseases.

Often described with orange blossom, white peach, apricot, and tropical fruit aromas and flavors reminiscent of Viognier (although there is no genetic relationship), Albariño has a defined minerality that complements its innate tartness, pairing it splendidly with seafood.

Although most Rias Baixas Albariño is fermented in stainless steel, some producers such as Adega Condes de Albarei have revived ancient winemaking formulas adapted to modern technology and winemaking. A wine such as their "Enxebre," made from a selection of ripe grapes from an old Albariño clonal selection undergoes maceration (without pressing) of whole clusters over several days. This is subsequently followed by primary fermentation at 64° to 68°F and an ageing period on fine lees.

Condes de Albarei also produces Carballo Galego, made from the best must that ferments for at least four months on its lees in new Bordeaux-style barrels made from Galician oak. Both techniques produce wines with more complex structure and richness, but less forward vitality.

Beginning in the late 1990s, Albariño began to take a foothold in U.S. vineyards, particularly on the west coast in Oregon's Umpqua Valley and several California AVAs. Four of the variety's pioneers were interviewed to learn their continued passion for and success with Albariño.

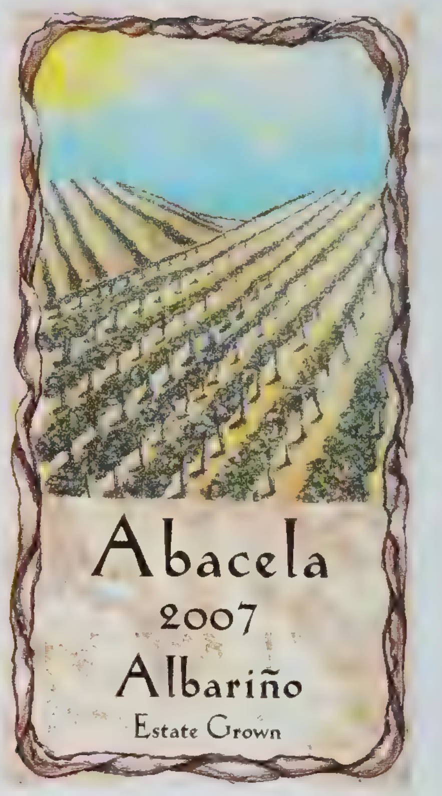
PARTICIPATING U.S. WINEMAKERS:

Michael Havens, Independent Wine Consultant, Napa, CA

Earl Jones, Abacela, Roseburg, OR

Louisa Sawyer Lindquist
Verdad, Los Olivos, CA

Christian Roguenant
tangent, San Luis Obispo, CA



Inspiration to plant

A 1996 visit to Rias Baixas prompted Michael Havens (formerly of Havens Wine Cellars and now an independent consultant, in Napa, CA) to plant

Albariño in 1997 in the Los Carneros AVA, using Adegas Morgadio, Rias Baixas massal selection, for budwood. The original release was 1999.

A few years later, a similar visit inspired Earl Jones (Abacela, Roseburg, OR). In 2000, he planted Albarino in Oregon's Umpqua Valley using the Duarte selection and UC Davis FPS Alvarinho (Portuguese) clone. The first release was the 2002 vintage.

However, it was "uniqueness of varietal character" that inspired Christian Roguenant, (tangent Winery, San Luis Obispo, CA), who also visited Spain's Rias Baixas. First release was the 2005 vintage from vines planted in 2000.

While working at a forward-thinking east coast wine shop (Amagansett W&S) early in her career (1990), Louisa Sawyer Lindquist became enamored with Albariño when the store stocked 11 different Albariños for summer drinking.

Typical Albariño clusters at Abacela (Roseburg, OR).

"When I came to California," Lindquist says, "I wondered why there were no Spanish varieties planted — given the Spanish history of the state. When I had the opportunity in 1996 to source budwood from Babcock Vineyards (Lompoc, CA), Albariño was on top of my list for varieties I wanted to work with." An initial planting of 150 vines expanded to the two acres Verdad has planted in Los Olivos. The initial release was vintage 2000. In 2005, two additional acres were planted in the winery's Edna Valley property.

Best characteristics

Minerality is Albariño's holy grail for Havens. He believes floral and tropical fruits are the best aroma descriptors with firm, lively stone fruits, bracing acidity, great length, and an almost marine minerality as finest flavors.

Jones points to bright fruit and sharp acidity making Albariño a refreshing, food-friendly wine. "It's delicate and subtle with Viognier-like aromas, consisting of apricot, peach, and tropical fruits such as banana, guava, and grapefruit over a back-drop of citrus and hints of green apple with focused mineral flavors and brisk acidity."

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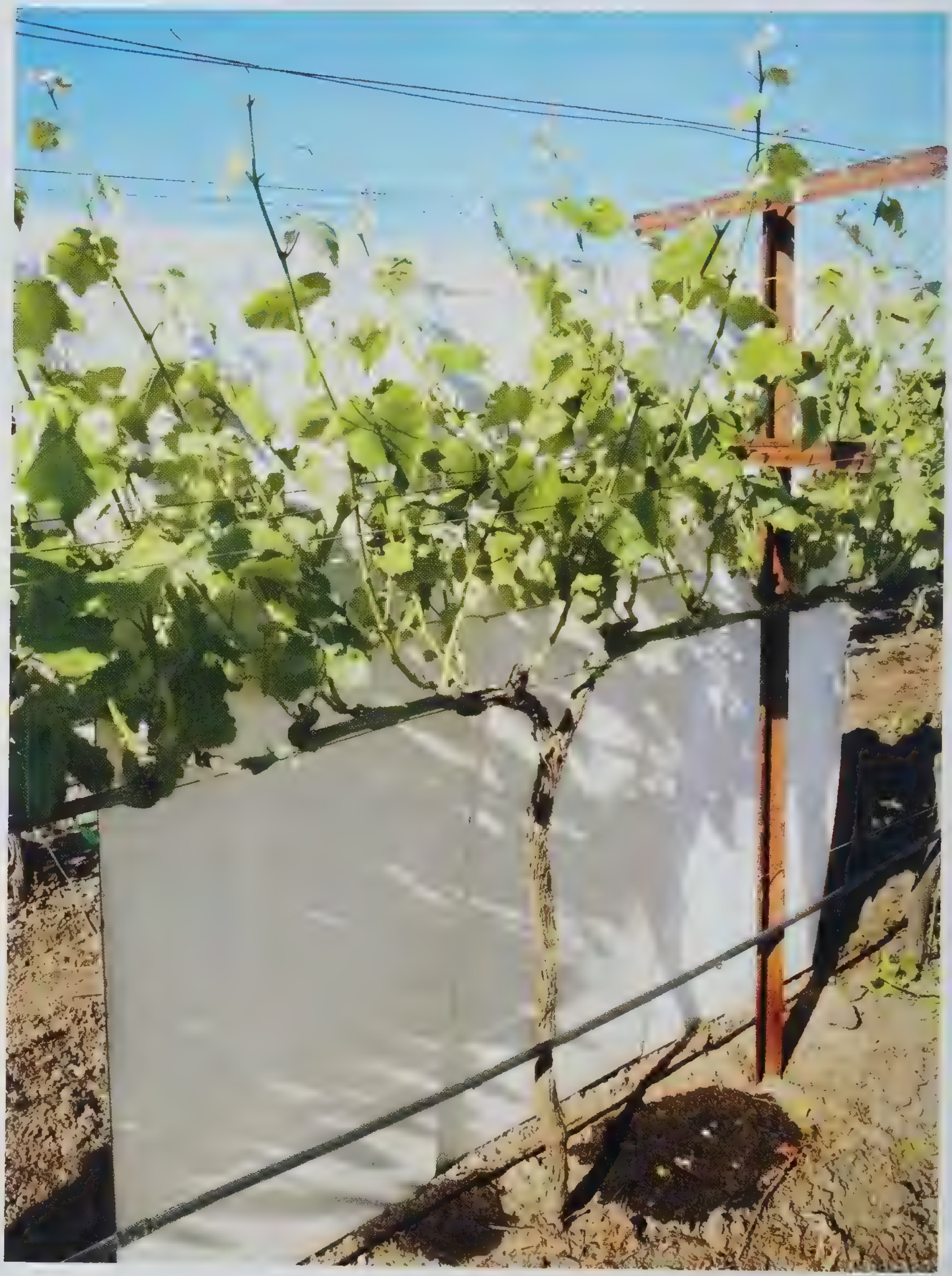


Albariño grapes for Havens Wine Cellars on a high Y trellis, allowing positioning of shoots to separate clusters and adequate sunlight onto clusters, with enough shade to prevent sunburn. Bloom photo in the Fore-Hill Vineyards, Stewart Ranch (Carneros, AVA).

Roguenant finds terpenes, C13, and ethyl esters particularly heptanoate, dodecanoate, and isoamyl alcohols as the best characteristics of Albariño. Intensity of these aromatic and flavor molecules vary depending on the fruit source.

Orange blossom, white peach, Meyer lemon, and mineral characteristics are among Lindquist's top aromas and flavors sought in Albariño. "There's always a little bitterness, stemming from the skins, with the variety," she says, "and that comes into balance with peach and citrus notes."

Suitable site

"Although eastern Los Carneros is not significantly rainy during the growing season," Havens says, "it's cool and windy with very challenging marine sediment clay and medium gravel soil. Nighttime temperatures are actually quite a bit lower than coastal

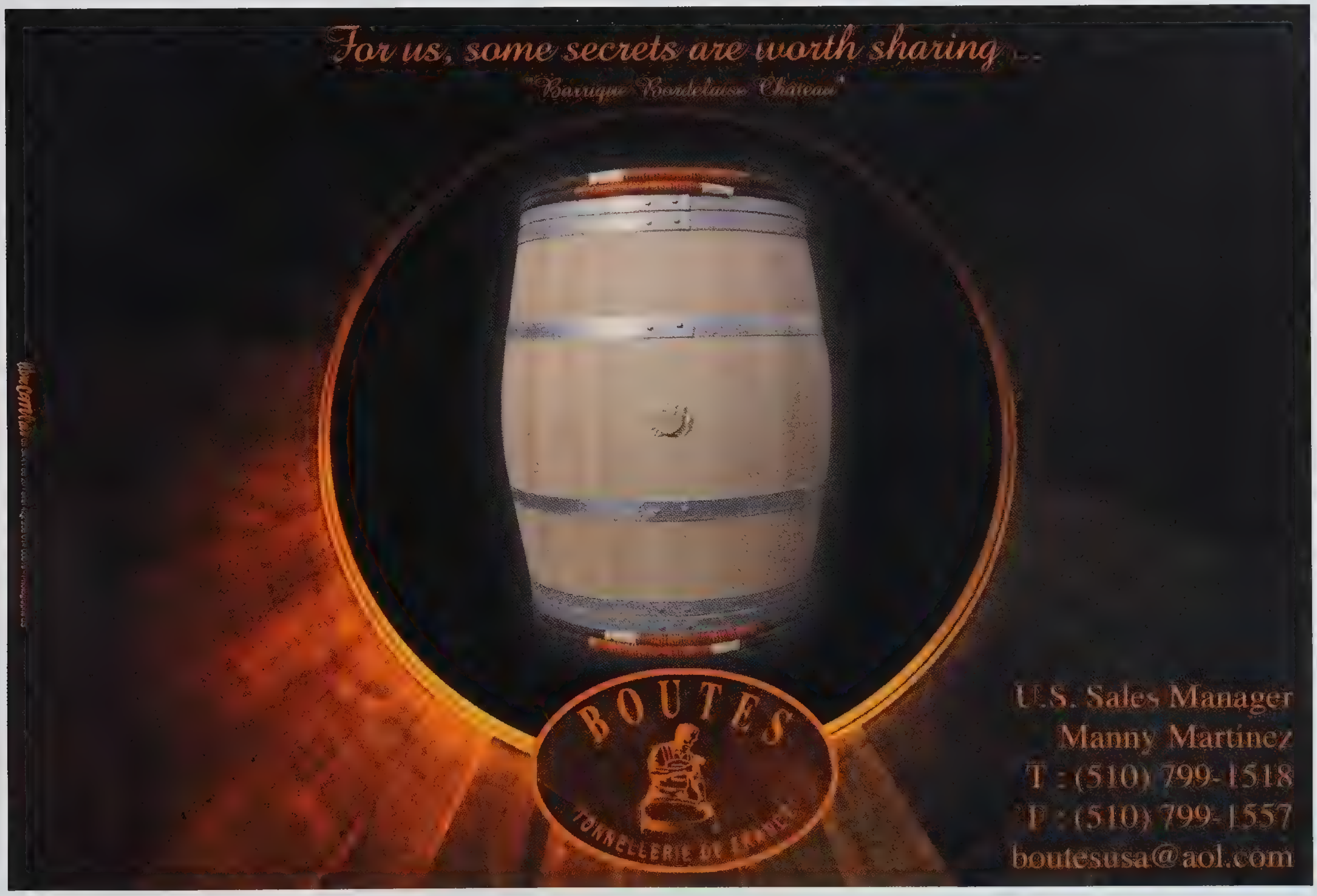
Rias Baixas, which is warmed by the moderate Bay of Biscay, while Carneros is chilled by the frigid North Pacific.

"We have more daytime heat accumulation, but this difference in diurnal range actually leaves us with higher natural acidity than most Rias Baixas producers I have encountered."

Jones remarks, "We cautiously planted Albariño on a northwest aspect of one of our steep hillside vineyards and it worked. It's cooler there. Expansion blocks include northeast and north aspects."

The first two Abacela blocks are seafloor sediments with cobble forming a rocky-sandy loam. Soil of the newer north slope planting is different in that it is comprised of an ancient clay loam strewn with erratic rocks and boulders. Abacela's growing season differs from the Galicia maritime climate by having much warmer days,

Albariño clusters approaching ripeness in Abacela Vineyards. Fruiting wire is 39 inches above ground, and canopy is hedged at 52 inches above fruiting wire. Yield is three tons per acre or less.



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Mostly Diablo clay which is a deep well-drained soil derived from weathered sandstone, shale, and mudstone with small amounts of serpentine deposits, characterize the tangent vineyard.

Edna Valley's average annual rain totals are only about a third of the Rias Baixas, "but in my opinion, a good thing," Roguenant says. "There's not so much extra canopy and berry size is small. Temperatures are more important. Cool Pacific Ocean marine influence pours right into the east-west oriented Edna Valley, moderating daytime highs in the upper 60° and mid 70°F, coupled with low 50s in the evenings.

"Albariño does not like warm temperatures with high UV radiation. Onshore afternoon winds in the Edna Valley cool the vines and extend the ripening season by closing leaf stomata."

A gravelly-clay loam soil profile suits Verdad's Los Olivos plantings, farmed organically since 1999 and now in the certification process. "Climate is very different from the Rias Baixas," Lindquist notes. "It gets warm in summer months but a nighttime marine layer creates a 35°F diurnal temperature difference. Overall degree days rank Los Olivos as a fairly cool climate. To retain natural high acidity, I pick early. Overall though, there's a greater weight to west coast U.S. Albariño than the Rias Baixas wines. To me, that's the biggest difference between them."

Rootstocks/planting density

Because it does well on clay and tolerates wet feet in Spring, Havens chose 101-14 rootstock. Planted 5x8, there are 1,089 vines/acre on bilateral cordon, trained into a "Y" trellis with two cross arms, 4½ and 6 feet above ground, and 18 and 24 inches wide.

On serpentine soils with high magnesium and low potassium ions, Jones chose rootstock 4453. Also, some vines are own-rooted to gain better understanding, not only of the soils but the variety. Plantings are 5x10 and 6x10, cane-pruned on a vertical shoot-positioned (VSP) trellis.

Three different budwood sources were planted for tangent. One is the same as Havens; another from a Spanish source near the River Miño, and a Babcock Vineyards field selection.

The vines in two tangent vineyard blocks are on 101-14 rootstock which tolerates wet Spring soil conditions and are spaced 10x5 (871 vines per acre) and 10x6 (726 vines per acre). Older plantings are on spur-pruned bilateral cordon which is trained into a VSP trellis. Some younger vines are being trained to cane-pruning with a VSP.

Verdad's rootstock choice was 3309 as a best match to soil type. It has proven to make the Albariño vines self-regulating with yields about 3 tons/acre (TPA). Vines are spaced 10x5 and trained on a bilateral cordon with VSP trellis.

Irrigation practices

Havens practices drip irrigation, focusing on deficits expressed by a pressure chamber. Vines receive small irrigations (1 to 2 gal) in July and August, then are stopped approximately two weeks before harvest.

After veraison, Jones deprives the vines of 40% evapotranspiration and monitors leaf water potential, irrigating to mitigate heat stress.

Depending on the amount of rain received during Winter/Spring, the tangent vineyard blocks may not receive irrigation until early June. Then 5 to 8 gal/vine per week is applied, usually in a split application. To verify need for irrigation, local evapotranspiration data in combination with soil moisture probes are used. "In our area," Roguenant maintains, "Albariño is a vigorous variety, not requiring a lot of water."

During the summer, Verdad Albarino vines receive drip irrigation (4 gallons per week per vine). About two

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months prior to harvest, irrigation is reduced to 2 gallons per week/vine to maintain canopy without encouraging new growth. Irrigation is stopped one week prior to harvest.

Harvest parameters

For a single picking of a uniform 2.3 acres, Havens picking parameters include 21.5 to 21.7° Brix, 3.10 to 3.15 pH, and 12 to 14 g/L TA. "Acidity is critical," Havens remarks, "but avoiding over-ripening is even more critical for preserving freshness and high-toned aromas. Among grape flavors, I seek ripe pineapple, guava, and a very slight hint of honey."

Abacela's single picking is usually at a pH of 3.00+/–, 0.78 to 1.0 TA, and Brix all-time range is 21.8° to 24.6° for different vineyard blocks, although blending of the blocks produced tank lots in the range of 22.3° to 23.1° Brix. The latter results in alcohol levels of 12.8 to 13.5%.

"We hope to crop up from 2.5 to 3 tons per acre and lower the Brix," Jones remarks. "But we've not been successful so far. Ripeness is important but we would like to lower the alcohol level." Grape flavors indicating optimum picking for Jones are: "first hint that citrus and green apple are being replaced with apricot and tropical flavors."

For Roguenant, physiological fruit ripeness in both aromas and fruit flavors are most important and this typically occurs between 22° and 25° Brix and TA between 9 and 13 g/L. Fruit is block-picked depending on fruit physiology, such as floral notes and terpenes.

Lindquist considers the ratio between Brix (at 21° to 22°) and TA (0.70 to 1.0) as the most important picking parameter. "I don't want high alcohol, so I will not let Brix rise above 22°. Above that, it's stylistically incorrect. If the acidity is too high, I'll put the wine through malolactic fermentation (MLF)."

Viticultural pressures

Havens cites low vigor as the single biggest viticultural problem with Albariño in the sites he works with.

Jones suggests the need to reduce vine stress with irrigation.

High vigor is cited by Roguenant as the sole viticultural problem.

"Albariño is an easy grape," Lindquist says. "It's essential to keep grape bunches shaded sufficiently. To retain aromas and phenolics, we've given the canopy more flop and in 2008, leaves will not be pulled on the afternoon side of the vines. I'm trying to achieve longer hang time to enhance the flavor profile and perhaps develop nuances that we've not had before."

Havens' processing preferences

Whole cluster pressing is Michael Havens' preference, since the juice extracts easily and he wants to preserve primary fruit character. The first SO_2 addition (50 ppm) is made in the juice tank. Inoculation is with QA23, a yeast isolate from northern Portugal. "It's a high ester producer," Havens explains, "much of which survives into the bottle (hydrolyzes very slowly).

A 21-day fermentation is slow (starts at 60°F, drops gradually to 55°F, finishes coasting again to 60°F) and completes with less than 0.20 g/L RS."

Rather than MLF, Havens de-acidulates the must with potassium carbonate. "MLF metabolizes," he explains, "and thus destroys many esters and much of the primary fruit character we value."

Wine remains on light lees (without stirring) in 25-year-old neutral oak uprights with any overage in 10-year-old neutral oak puncheons and stainless steel kegs.

Bottling of 500 cases is done in late February and wine is released April 1.

In the Abacela cellar

Jones sees no reason to whole cluster press. He crushes grapes, which received 25 to 30 ppm SO_2 added at the crusher, and allows them to soak on skins for a few hours to gain extract before pressing.

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So far, there's uncertainty about yeast impact on aromas and flavors. Juice is fermented cold in stainless steel tanks and peaks at 56° to 58°F. On average, fermentation is complete in 50 days and the wine does not undergo MLF.

Wine remains in tank on lees with batonnage until prepared for the bottling of 500 to 650 cases. When new plantings come on line, the expectation is a bump to 2,500 cases.

In the tangent cellar

Grapes are destemmed before pressing, then 50 ppm SO_2 is added to juice in tank which is fermented with QA23 yeast, the same isolate from northern Portugal used by Havens.

Fermentation begins at 60°F, drops gradually to 52°F and finishes at 60°F in 30 days. MLF depends on the vintage and acid level, but the regimen is always a stainless steel fermentation on lees.

Approximately, 2,000 cases are bottled in early April and released May 1.

In the Verdad cellar

To avoid natural Albariño bitterness, Lindquist presses whole clusters and adds 40 to 50 ppm SO_2 to the juice. She describes the bitter aspect as similar to Gewurztraminer. At first, she believed bitterness was caused by young vines but now believes it's inherent.

To uplift floral characteristics, juice is fermented in a 600-gal stainless steel tank with remaining juice in French oak barrels with BA-11, a Portuguese yeast isolate.

Fermentation completes in 12 weeks during which peak fermentation temperature is 59°F. Once fermentation completes, wine is consolidated into tank and prepped for bottling in February.

Until new Edna Valley plantings yield in the 2008 harvest, the current production (340 cases) is bottle-aged two months before release.

Optimum drinking

Within the first year of harvest to appreciate its liveliness is Havens' preference for optimum drinking. "At two to three years," he says, "it will take on some of the 'petrol' notes of aged Riesling. Beyond that it declines, in my experience."

Although Jones believes that four to six months bottle-age benefits the wine, in point of fact, it's released sooner. However, it holds well in bottle for at least one to two years. "There's some vintage variation as to when the wine peaks in taste but our 2004 is still drinking well," Jones reports.

Depending on wine style, Roguenant suggests optimum drinking between three weeks and seven to eight years but puts the average at one to three years.

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Lindquist offers her recommendation of one year from vintage and one to two years at the outer limits of optimum drinking.

Last drop

Let's call this last fork-full because, after all, wine is meant to pair with food.

Any seafood, raw, sauced or simply cooked, is the Havens preference. He also likes it with curries or other spicy dishes, whether of Asian or Latino influence. "And with the best Albariño," he says, "foie gras (yes, foie gras!)."

Jones suggests fresh seafoods, especially shellfish, and oysters in almost any format. With Albariño, soft-shell crabs have met their vinous match when sautéed in a mix of olive oil and butter then deglazed with Albariño and served with a drizzle of cilantro mayo. It's also great with sushi, seafood in cream sauces, and goes well on a hot day *todo solamente.*

"Any seafood," is on Roguenant's fork with a chilled glass of Albariño.

Fresh oysters, grilled octopus with paprika, and clams top Lindquist's menu pairings. ■

Growing and making Albariño in Spain

Luciano Amoedo, enologist for Martin Codax in Spain's Rias Baixas D.O., answers queries about growing and making Albariño:

Eleanor & Ray Heald (ERH): Rias Baixas is rainy and the greenest part of Spain. What factors make the Albariño grape so suitable to the region?

Luciano Amoedo (LA): Average annual rainfall is 71 inches per year but this is not an obstacle for Albariño thanks to our soils that permit very good drainage. Excess moisture in winter is perfectly drained, and in summer, we have hydric stress which is positive for grape ripening. Mild temperatures in the Salnes Valley of the Rias Baixas during the year also benefit two important characteristics of the Albariño grape: its aromatic potential and fresh acidity.

ERH: What is the soil profile of your vineyards?

LA: Granite soils with more than 70% sand. Organic matter is between 3% and 5% and typically acid soils (natural pH is 5, corrected up to 6.5).

ERH: What is the clonal selection of Albariño?

LA: There is no clonal selection of Albariño. Vineyards across Salnes Valley have a great natural clonal diversity which gives wines their high complexity. Studies discuss about 135 different clonal selections.

ERH: What rootstocks are planted in the vineyard? Why?

LA: We use mainly two rootstocks: 196-17C is a Spanish selection adapted to acid soils; 110-R is used more in dry and stony soils. For more fertile soils, less vigorous rootstocks such as 420A and 101-14 are being studied.

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ERH: What is the planting density?

LA: Between 283 and 486 vines per acre

ERH: What training and trellising is employed?

LA: The most used trellis is called "Parra" and it's unique in the world. It's a horizontal system where shoots grow horizontally (not vertically) 5 to 6 feet above ground, and it's similar to the "Pergola Doppia" used in Trentino, Italy.

ERH: What are the harvest parameters? pH? TA? Brix?

LA: pH ranges 2.9 to 3.2. Sugar is 21° to 23° Brix, and TA is 7 to 12 g/L.

ERH: Which parameter is most important for Albariño at harvest?

LA: The most important is a correct balance between sugar and acidity. Ideally, we would like to preserve natural acidity while achieving 22° Brix.

ERH: Is there only one maturity picking or more than one? If more than one, how are decisions made?

LA: There is always a differentiation due to specific vineyard microclimates but these differences are not huge. Harvest can take 25 days as grapes ripen gradually and are picked depending on acidity and Brix goals.

ERH: What are the grape flavors you seek at harvest?

LA: With respect to tasting grapes, Albariño is almost a neutral variety. Nearly all aromas come from aromatic precursors that appear during alcoholic fermentation.

ERH: What is the biggest viticultural problem with Albariño?

LA: The biggest problems are fungal diseases, especially downy mildew.

ERH: Do you press whole clusters? Why or why not?

LA: We do both. Quality of both juices is the same. The only difference is that natural juice settling, which we always do, is quicker with whole cluster pressing. We combine both for fermentation.

ERH: When do you make the first SO_2 addition? How many ppm?

LA: All grapes are hand-harvested in 20Kg plastic crates. When we transfer those grapes to larger crates of 400Kg we add SO_2 to protect grapes from oxidation. Concentration is 2g for each 100Kg of grapes.

ERH: What is the yeast impact on aromas and flavors?

LA: We allow native yeasts; these are going to allow the liberation of all the main varietal aromas of Albariño, so the impact is huge.

ERH: What is the peak fermentation temperature?

LA: 18°C (64°F).

ERH: On average, how many days does it take for fermentation to complete?

LA: 15 days.

ERH: Does the wine undergo malolactic fermentation? If yes, why and inoculated or not?

LA: In order to control acidity and depending on the vintage, only a percentage of the wines undergo malolactic fermentation. There is no inoculation; all bacteria are native.

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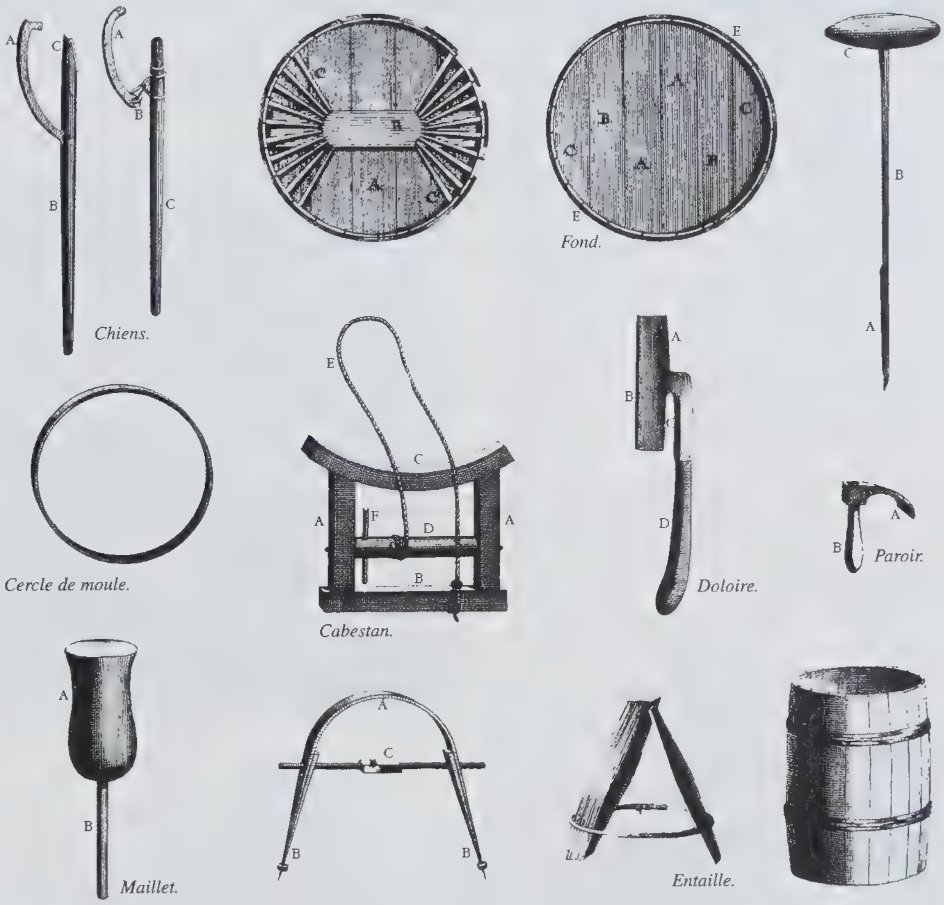

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ERH: Is this stainless steel tank fermentation? On lees in tank or not?

LA: It is a stainless steel fermentation and the wine remains on fine lees.

ERH: Is there any barrel ageing? If yes, what is the age of cooperage?

LA: Martin Codax, our main wine brand is not barrel aged. We have another brand called "Organistrum" that is barrel aged. Organistrum is a blend of wine that has been fermented in French oak barrels and remains there for three months. Barrels are used only for three years.

ERH: How much bottle ageing does the wine receive prior to release?

LA: Wine gets one month in bottle to settle down after stress during bottling.

ERH: As a wine, what is the best characteristic of Albariño?

LA: Its main characteristic is fresh and crisp acidity and the varietal character of a native variety.

ERH: What are the principal aroma descriptors?

LA: Citrus fruits (grapefruit and lemon), peach, pear, melon, pineapple, and green apple.

ERH: What are the principal flavor descriptors?

LA: Citrus sensations, jellies and fruit salads, mirroring fruits described as aromas.

ERH: When is the optimum time to drink bottled Albariño?

LA: The best moment is when you feel like drinking a great white wine! Albariño can conserve its characteristics during its first four years if cellaring conditions are correct.

ERH: How long do you advise consumers to age Albariño?

LA: Temperature must not exceed 15°C (59°F) and it can be aged for four years without losing quality. It depends on consumers' preferences.

ERH: What food harmonies do you suggest?

LA: Traditionally, Albariño has been matched with local fish and local seafood although this wine can be enjoyed with rice dishes, white meats or even sushi.

ERH: How many cases of Albariño does Martin Codax produce?

LA: 40,000 cases are imported into the U.S. ■

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2008-2009 STATE OF THE WINE INDUSTRY

EFFECTIVE marketing/sales strategies determine success

BY Rob McMillan, Founder, Wine Division Silicon Valley Bank

Creative souls seeking refuge in a rural lifestyle have long gravitated to the wine business, but with a nose of Provence or the Côte d'Or. Today however, the wine industry is experiencing both short-term cyclical and economic shocks that are impacting its bucolic roots as well as creating longer-term structural repercussions. The wine industry has been transported from a once cottage-based part-time industry into a high-growth $30 billion business supporting merger and acquisition (M&A) activity in the hundreds of millions of dollars.

Each year Silicon Valley Bank (SVB) researches critical issues that face the wine industry and summarizes the findings in an annual *State of the Wine Industry Report.* At times, real and relevant information is difficult to come by since this is largely a private industry.

Therefore, in addition to SVB proprietary data, and its unique experience and knowledge of the wine industry, Silicon Valley Bank conducted an extensive survey to gather information on a variety of topics including pricing, marketing, sales strategies, and the challenges vintners face today. Nearly 500 surveys were completed. This report lends insight to current conditions and trends that are affecting the industry, and forecasts what may lie ahead in the coming year.

Executive summary

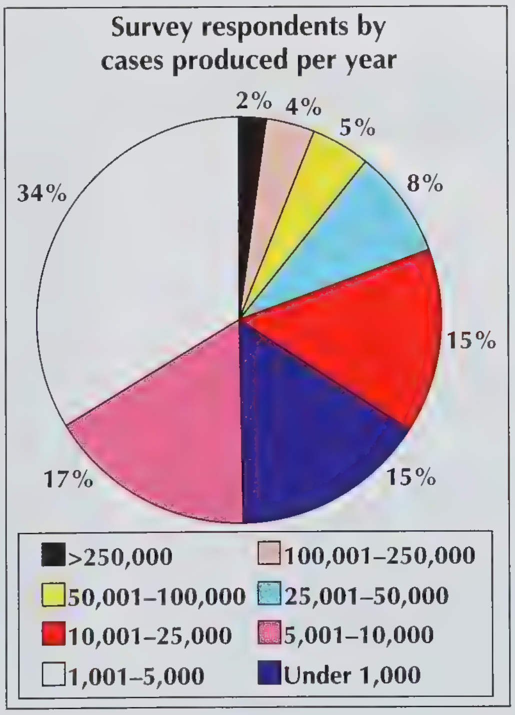
Despite the current and well-reported downward-trending economic conditions in the U.S., we feel 2008 and at least half-way into 2009 will be generally positive for the wine industry as a whole. We expect to see a small deterioration in business conditions in the fine wine segment, as supply is running in balance to short.

The opportunity to raise prices will be limited, except for wineries selling on allocation or largely direct. Financial performance of the fine wine segment will be marked with moderate growth rates falling from last year's cyclical highs, along with slightly decreasing gross and net profit margins.

Growers producing grapes for higher volume wine production should experience improving trends as the weakening economy forces value-conscious buyers into lower-priced, moderately-positioned price segments. Supply, which has been consistently long for some time, will start to experience a boost as fine wine producers seek alternative sourcing for what is becoming a short market in premium winegrapes.

Overall consumption of both foreign and domestic wines in the U.S. has reached $30 billion. This growth is attributed to strong consumer acceptance of foreign wines, an increasing number of younger consumers across all wine segments, and increasing sales at higher price points, according to the Wine Market Council.[1]

Improved conditions for growers selling into the higher volume segments are



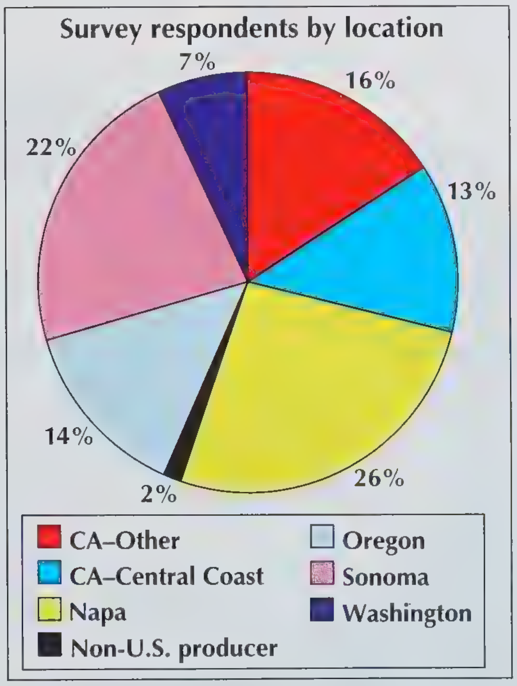


Figure A: Production plans

We plan to ________ in the next 12 months.	Case production 1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
decrease prices by more than 8%	3%	1%	0%	0%	0%	0%	0%
decrease prices between 3–8%	0%	1%	0%	0%	0%	0%	0%
decrease prices less than 3%	1%	1%	0%	0%	0%	0%	0%
keep prices mostly unchanged	68%	57%	45%	34%	48%	57%	38%
increase prices less than 3%	9%	15%	23%	29%	18%	30%	31%
increase prices between 3–8%	16%	18%	24%	33%	30%	13%	24%
increase prices by more than 8%	3%	7%	8%	4%	5%	0%	7%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

Figure B: Inventory

Overall we have ________ inventory for our anticipated sales demand in 2008.	Case production 1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
excessive	7%	2%	1%	1%	0%	0%	0%
too much	18%	21%	23%	14%	3%	9%	14%
about right	47%	44%	46%	54%	60%	52%	55%
too little	20%	26%	22%	26%	30%	26%	31%
very short	8%	7%	8%	4%	8%	13%	0%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

expected in 2008. This is due to a weaker U.S. dollar (USD) slowing bulk imports, lower volumes in the tank from prior harvests, and a strong demand for wines in the $9 to $14 range. However, growers producing grapes destined for wines with price points under $8 will likely find business conditions more difficult in the long term.

For fine wine, we expect 2008 growth rates in the low teens and slightly lower profits. Concerns in this segment include everything from high costs of sought-after vineyard properties, foreign competition, brand proliferation, a weak USD, grape shortages, distribution over-consolidation, regulatory processes impacting free trade, and evolving — yet still inefficient — Internet and consumer sales models. However, in the long term, we expect sales growth to be in the 4% to 6% range for the wine industry as a whole.

Despite the concerns mentioned, output from the SVB Wine Conditions Survey shows that winery owners believe 2008 will be a far better than average year on most fronts, and *outside of recession fears, the industry is optimistic. While we generally support their optimistic view, we suggest many may be overly optimistic and we offer a note of caution.*

A recession is upon us and sales growth rates will likely moderate. In addition, many of the fundamental precepts that wine businesses have relied on in the past are presently moving under foot. We believe the margin-squeeze many wineries feel today may not be a short-term trend.

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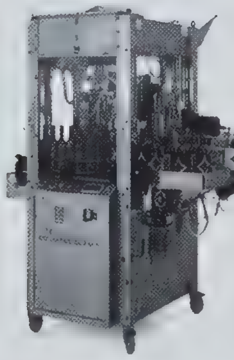

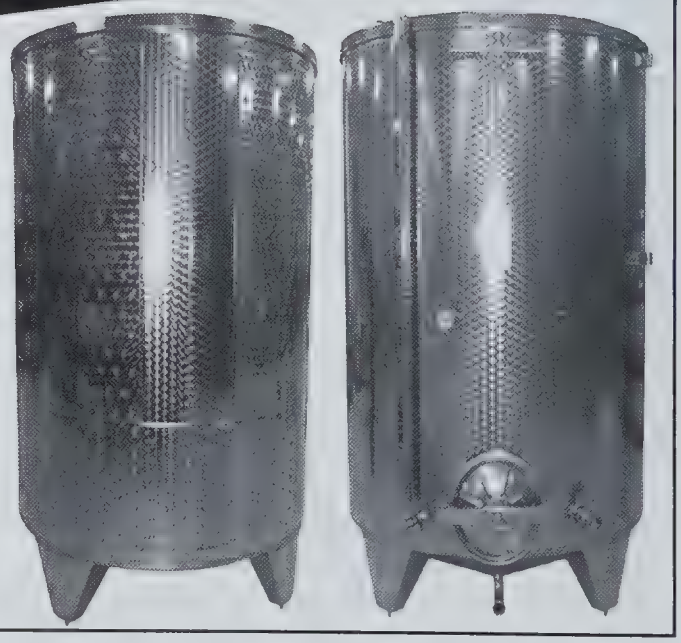

The negative impact will be winery-specific, and depend on several factors including price points, brand strength, appellation, volume produced, and most importantly, sales strategy.

A wide disparity between winery business models continues to emerge, making an "average winery" even more difficult to define today. This increases the risk for owners and investors significantly, as you will see in this report. Understanding the factors that affect your winery is critical now. We recommend seeking out industry experts' views that enhance and support the strategic planning process.

Bottle pricing

Each year, wineries are faced with the same question: "How should I price my wines in the market? If I guess high, I might not sell all my wine. But if I guess low, I will leave hard-earned profit on the table."

It is not an easy choice and many times, the decisions are made with pure instinct and few analytics. You may be feeling a little unsure as to what information you should use to make your decisions. Let us help you become a little more organized.

When the fine wine segment was surveyed in March of 2008 for the SVB Annual Wine Conditions report, sales growth expectations for the industry were approximately 17%. When asked about price increases, most reported that they planned to leave their pricing unchanged or only increase the price to keep abreast of inflation. That means many of the respondents expect to see their sales

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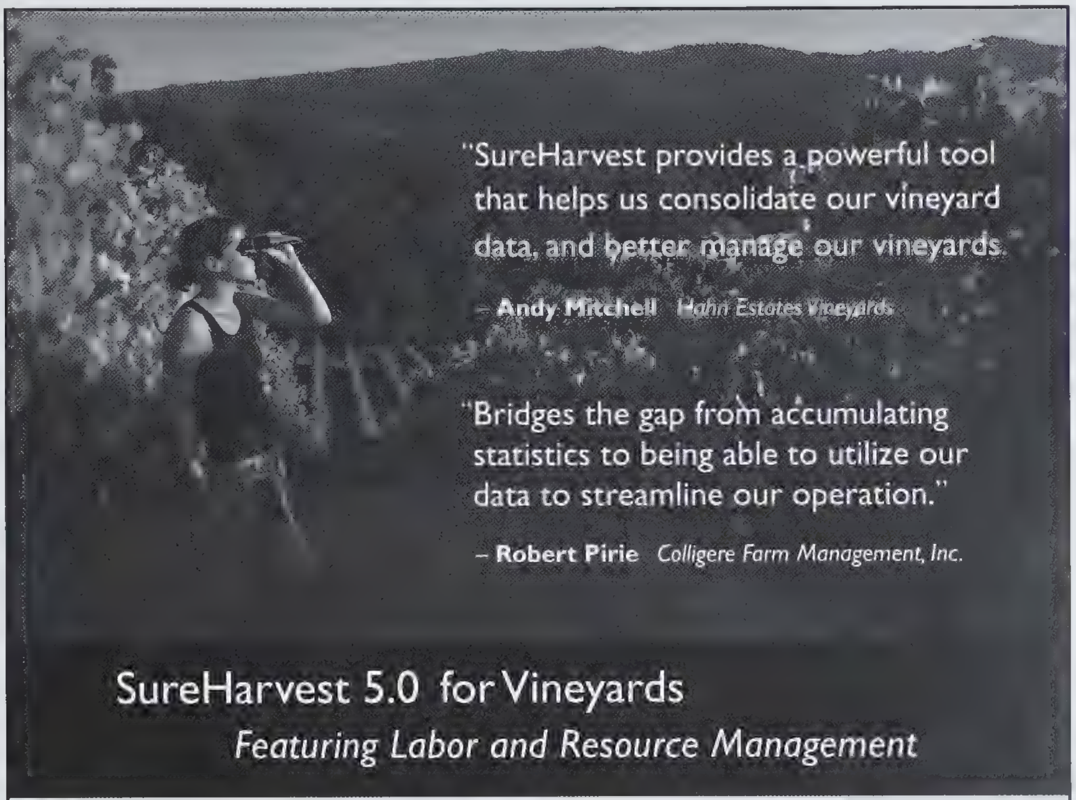

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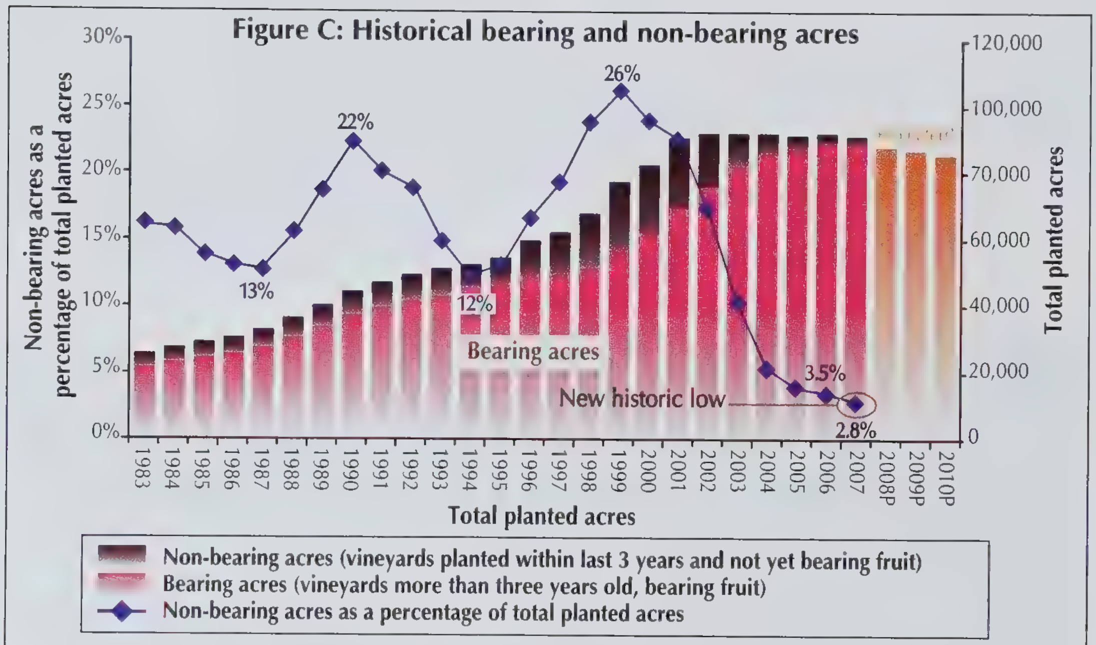

Figure C: Historical bearing and non-bearing acres

Includes: Napa Cabernet Sauvignon, Napa Merlot, Napa Cabernet Franc, Sonoma Cabernet Sauvignon, Sonoma Chardonnay, Sonoma Merlot, Sonoma Pinot Noir, Mendocino Pinot Noir, Santa Barbara and San Luis Obispo (District 8) Chardonnay and Santa Barbara and San Luis Obispo (District 8) Pinot Noir.

* Projected bearing acres based on 2007 non-bearing acres maturing into bearing acres, less 2% annual replacement of older vines (assumes 50 year average life of vines).

Source: California Agricultural Statistics (Grape Acreage Report), Premier Pacific Vineyards (2008)

growth estimates realized through volume growth, not price change. That notion is supported by long-term trends that suggest much stronger growth opportunities in the sales of wines at higher price points versus lower. It is contradicted, however, by a grape supply that is trending to shortage for fine wine.

It is difficult to grow sales by volume if there is no volume in the tank.

As previously noted, winery owners appear to be optimistic about their fortunes for 2008. They are aware demand has been in a strong growth mode for some time and largely expect the year to be a good one. How can one explain the logical disconnect between an industry largely determined to keep prices flat, against the backdrop of a robust industry with strong growth and expectations for a good year?

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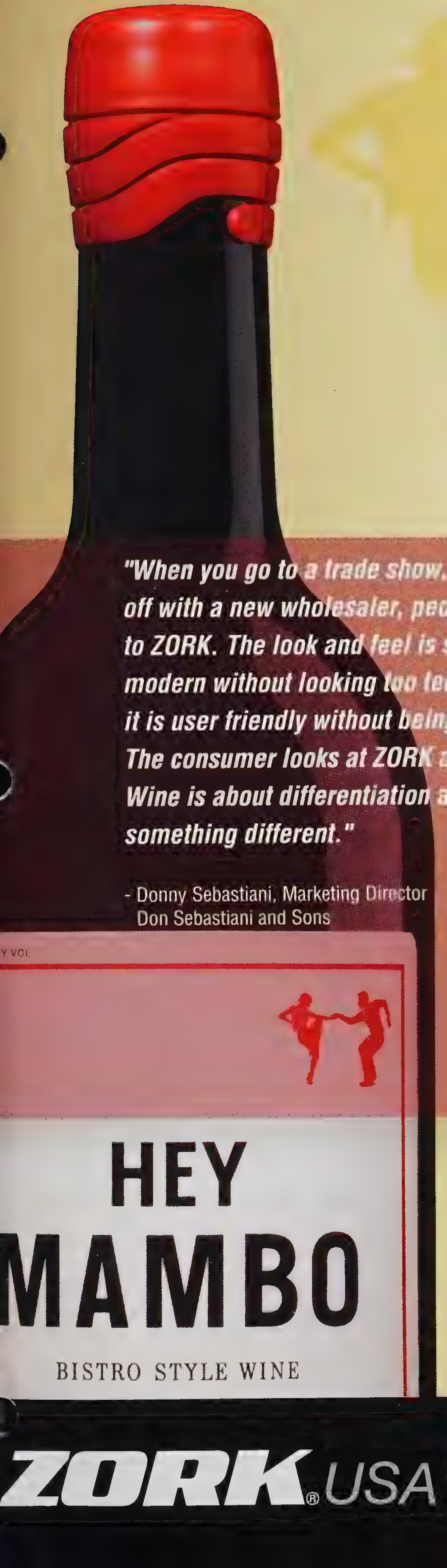

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The seeming contradiction can be reconciled. Pricing changes in the fine wine segment are largely influenced from four primary sources at present: the over- or under-supply of grapes and wine, expectations of the economy, competition from imports, and the ability to sell wine through traditional channels or direct to market.

Grape supply

Supply is impacted by planting, demand, cultural practices, and weather. Some have noted that the historic freezes experienced in Washington have moderated, and the total degree days in Oregon have increased. Some wonder if higher-alcohol wines in Napa and Sonoma are the result of global warming or winemaking changes, or if the record freeze in Napa and Sonoma in April 2008 was a one-time event.

No matter. It is a fact that the 2005 harvest was a record year in California and one has to wonder if unusual or widely moderating weather might lead to changes in supply going forward because historically, grape supply has been the largest determinant of wine business conditions.

When there is abundance, distributors ask for larger promotions and discounts, competition for shelf space increases, and for the fine wine segment, the consumer places a premium on hard-to-find wines.

Early in this decade, we began to observe the disparity of nonbearing acreage in the fine wine segment versus the growth rate in consumer

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demand. Because of that disparity, in last year's forecast we said, "With nonbearing acreage only a small percentage of planted acreage, we expect the surplus created by the large 2005 crop to fall into the rear view mirror, as vintners start to feel grape shortages across most major varietals in the premium wine growing regions starting with the 2007 harvest." That statement is largely an accurate depiction of the grape planting and supply in 2007.

Cellar supply

In the SVB Wine Conditions Survey (March 2008), we asked wineries throughout California, Oregon, and Washington how they viewed their cellar inventory. For reference purposes, 60% of the respondents to the survey sell wine with an average shelf price between $15 and $40.

By appellation, 42% of Oregon wineries feel they are short on wine, followed closely by Washington, then Sonoma County. Napa Valley respondents reported having the largest imbalance: 24% reported having too much inventory. That said, from SVB survey data, broker discussions, and client interviews, we believe the highest priced grapes in Napa Valley are running short at present.

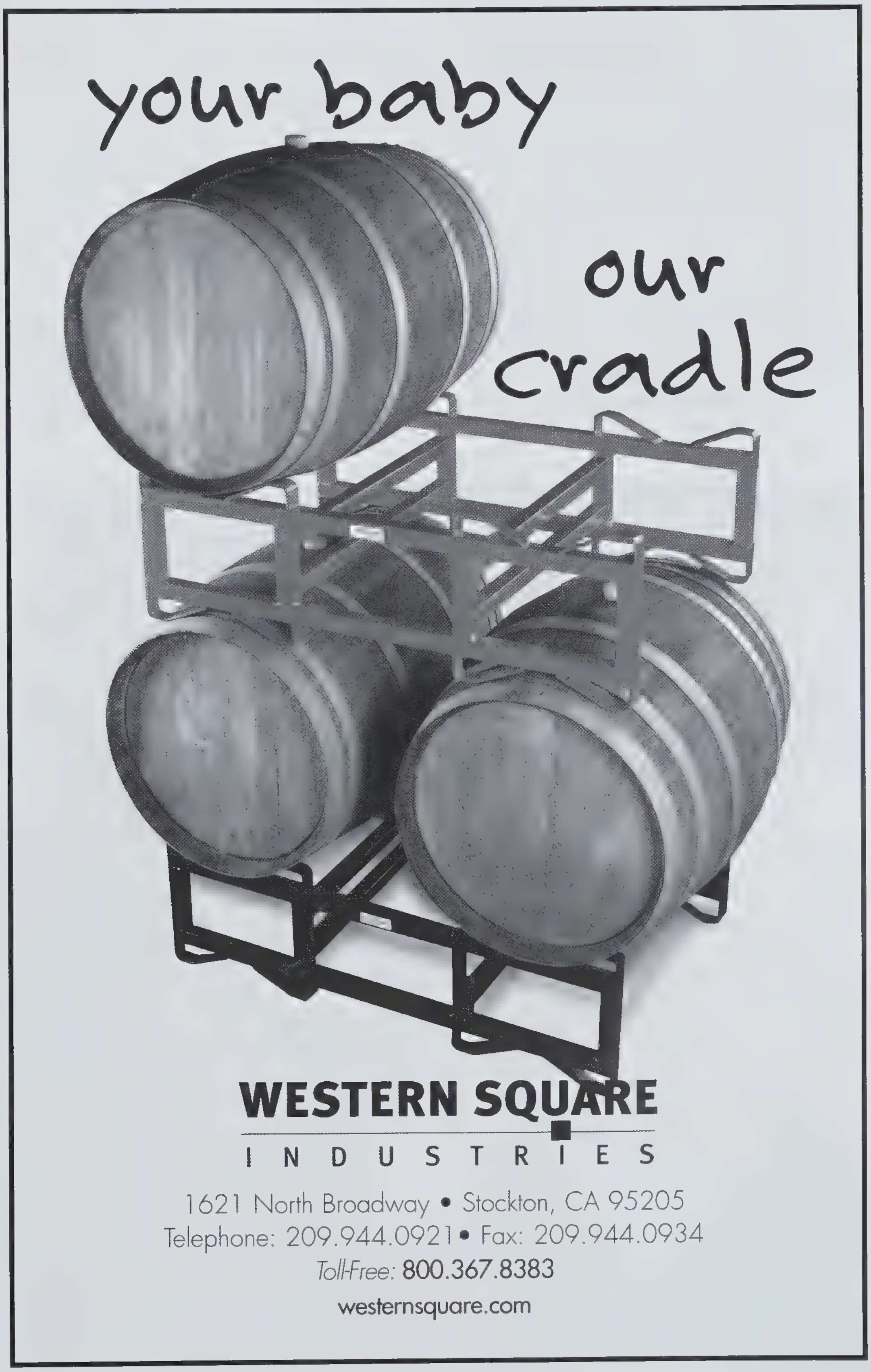
Overall, 80% of survey respondents replied that they have either adequate or short supplies in the cellar. Less than 18% have slightly too much. Interestingly, this is approximately a 10% shift from last year's survey when close to 90% reported they had sufficient amounts and only 6% had a surplus. This can be explained by expectations of recession and weakening restaurant sales, since actual supply has been reduced through average-size harvests combined with continuing strong demand.

When SVB interviewed clients, we found some making early decisions to lower their own growth estimates and hedge their bets against lower-than-hoped-for sales growth in 2008 by bulking off some of their 2007 vintage.

Grower supply

To obtain a better perspective on supply, we need to look past the inventories at the winery level, and into the anticipated growth in supply from both producers and growers compared to the demand for varietals.

According to the most recent grape-acreage report, nonbearing acreage in the coastal regions of California reached an all-time low in 2007 of 2.8%. Put simply, if all nonbearing acreage were to bear fruit in 2008, there would be a 2.8% growth in volume from the coastal regions, presuming unchanged yields. Given that demand for fine wine is running between 15% to 20% currently, it is likely that domestic production for wine will not meet domestic demand for at least the next several years.



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Broker view of supply

Understanding that a winery is in balance is not sufficient because it is a winery's business to stay in balance. The way it stays in balance is by selling off bulk wine in the secondary market. Understanding what that market looks like and comparing that with current retail consumption can reveal current supply trends in the market.

Figure D uses Trade Pulse scan data through March 7, 2008, and places the growth rate for 2007 with the trend in supply since 2006. (A note regarding bias — the scan data are skewed to grocery stores, and higher-price-point wines are subject to larger analytic volatility due to a smaller base.) Further, brokers generally have a view of the lower-priced wines even in the fine wine regions and fail to notice many exchanges that occur between wineries without broker assistance. Regardless, varietal growth rates for fine wine remain strong. The growth rate in Chardonnay continues its strong trend, as do Cabernet Sauvignon and Pinot Noir.

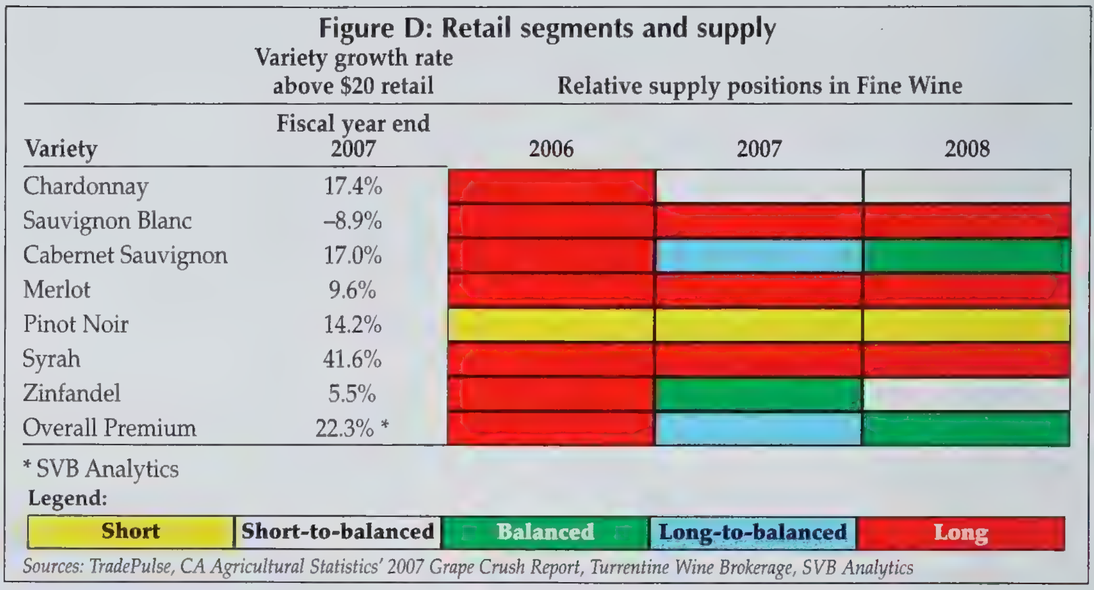


Figure D: Retail segments and supply

Variety	Variety growth rate above $20 retail Fiscal year end 2007	Relative supply positions in Fine Wine 2006	 2007	 2008
Chardonnay	17.4%	🟥	⬜	⬜
Sauvignon Blanc	–8.9%	🟥	🟥	🟥
Cabernet Sauvignon	17.0%	🟥	🟦	🟩
Merlot	9.6%	🟥	🟥	🟥
Pinot Noir	14.2%	🟨	🟨	🟨
Syrah	41.6%	🟥	🟥	🟥
Zinfandel	5.5%	🟥	🟩	⬜
Overall Premium	22.3% *	🟥	🟦	🟩

* SVB Analytics

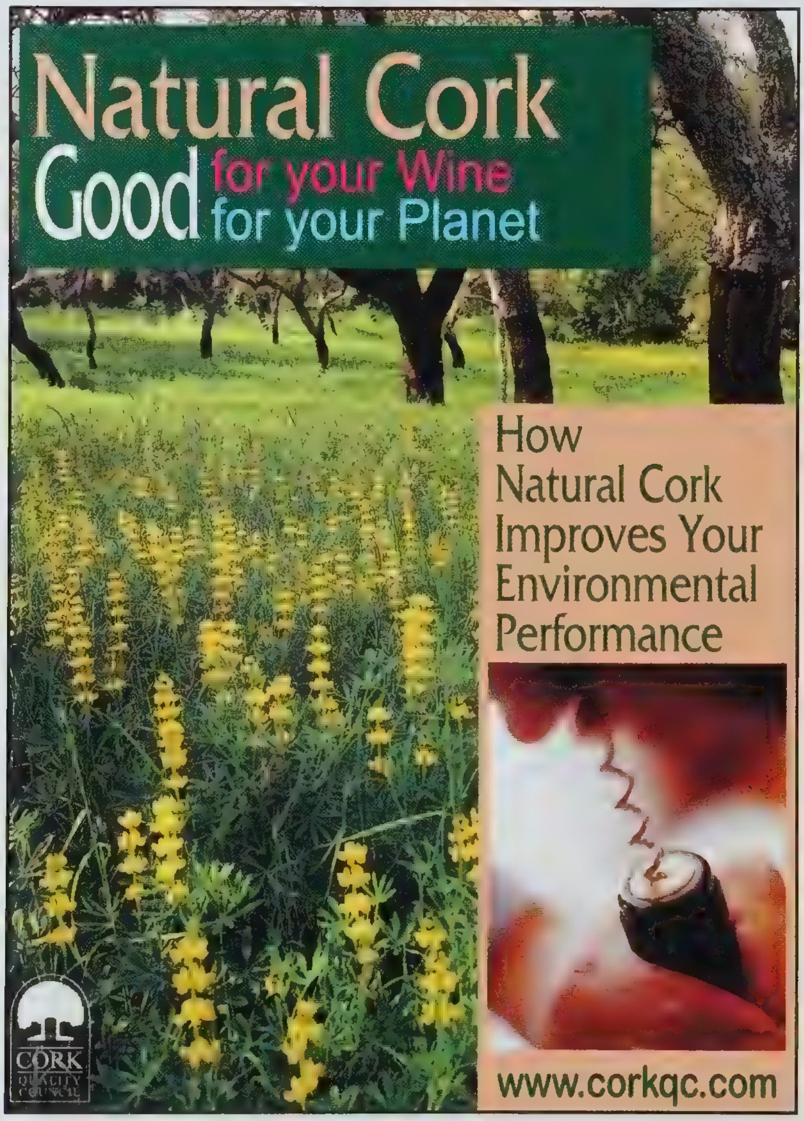
Legend:

🟨 Short	⬜ Short-to-balanced	🟩 Balanced	🟦 Long-to-balanced	🟥 Long

Sources: TradePulse, CA Agricultural Statistics' 2007 Grape Crush Report, Turrentine Wine Brokerage, SVB Analytics

Silicon Valley Bank's view on overall supply

When Silicon Valley Bank examines its crystal ball, and adds expectations of reduced sales growth from a recession and slowed restaurant sales, we do not think there is anything to truly fear. The facts suggest that fine wine is trending to shortage as it relates to supply. We forecasted as much in our 2007 and 2006 reports: "Given strong sales



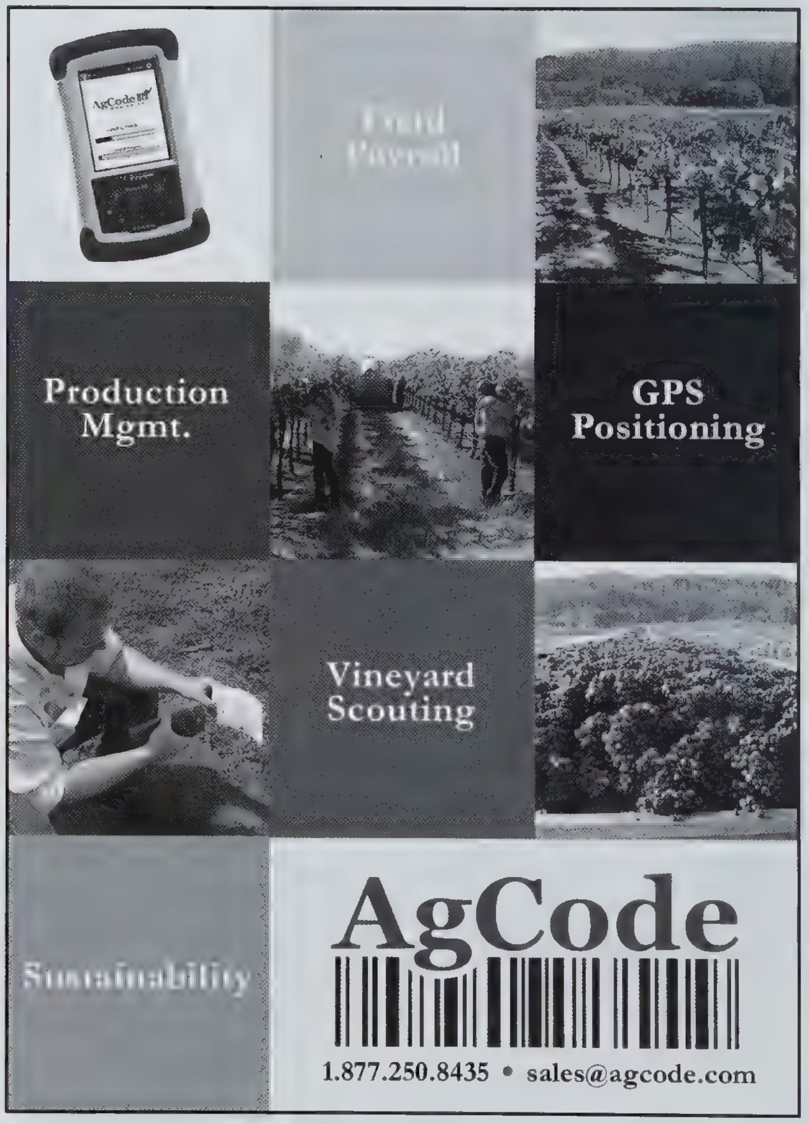


Figure E: Profitability factors

I expect our biggest hurdle(s) to sustained or improved profitability in 2008 are (pick no more than two):	Case production						
	1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
a recession	31%	32%	39%	34%	45%	40%	47%
inadequate distribution	15%	22%	12%	17%	9%	13%	13%
tightening credit availability due to the sub-prime mess	7%	5%	7%	4%	6%	8%	0%
the weak dollar	2%	3%	7%	8%	6%	13%	7%
inadequate staffing	6%	5%	4%	6%	5%	5%	3%
inadequate labor supply	2%	3%	1%	3%	2%	5%	10%
problems with direct sales channels	18%	10%	9%	9%	5%	0%	3%
the evolving regulatory environment and unsettled laws regarding the sale of wine	15%	14%	11%	8%	6%	5%	10%
other	6%	6%	7%	11%	17%	13%	7%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

growth in many instances, the large 2005 harvest will probably mask a shortage that will start to show itself in 2007 and be fully evident in 2008."

Pinot Noir is currently short. Chardonnay is short for the highest price points and the moderate price points are trending to shortage. There is a shortage of the best quality Cabernet Sauvignon fruit, but there is still adequate supply for the current market. Merlot is still long, but the excess is being whittled down due to both varietal consumption and blending. Syrah remains significantly long across the board.

We see a large and growing gap between planted acreage and the increasing demand for fine wine grapes. To meet the demand, wine will come from emerging appellations that have historically seen their grapes go into lower-priced wines, and imports from traditional and new world wine-producing countries that do not mind taking a hit on the exchange rate to establish market share.

SVB believes, at least for the fine wine segment, that additional planting is needed to meet domestic demand. Investment in those plantings has to be done in a manner that supports a reasonable market return, or the high costs of real estate will create a high floor under the domestic wine industry.

Appellation-building will be even more important should such a long-term trend emerge, and cooperation between growers and wineries will be vital through associations and quality initiatives to ensure regional brand strength over the long run.

Expectations on the economy

Respondents to the SVB Wine Conditions Survey called a recession the greatest current threat to sustained profitability.

There has always been debate about wine, and fine wine in particular: is it counter-recessionary or subject to recessionary impact?

The answer is that it is a little of both. People still drink wine, but sales typically drop off normalized growth rates as restaurant sales slow, and those wines are then forced through alternative channels. The normal shift is to see cases transition from on-premise to off-premise. The volumes removed from restaurant sales are spread between mass merchandisers, chains, and specialty retailers. It takes time for cases to be physically repositioned, and even more time for consumers to grow accustomed to seeing a new product in a location and to see it gain traction.

Yet overall, wine is still an affordable luxury even in a bad economy. While wine is not recession-proof — like electricity and visits to the doctor — people still continue to consume wine even during difficult times, and our experience is that wine continues to demonstrate volume growth.

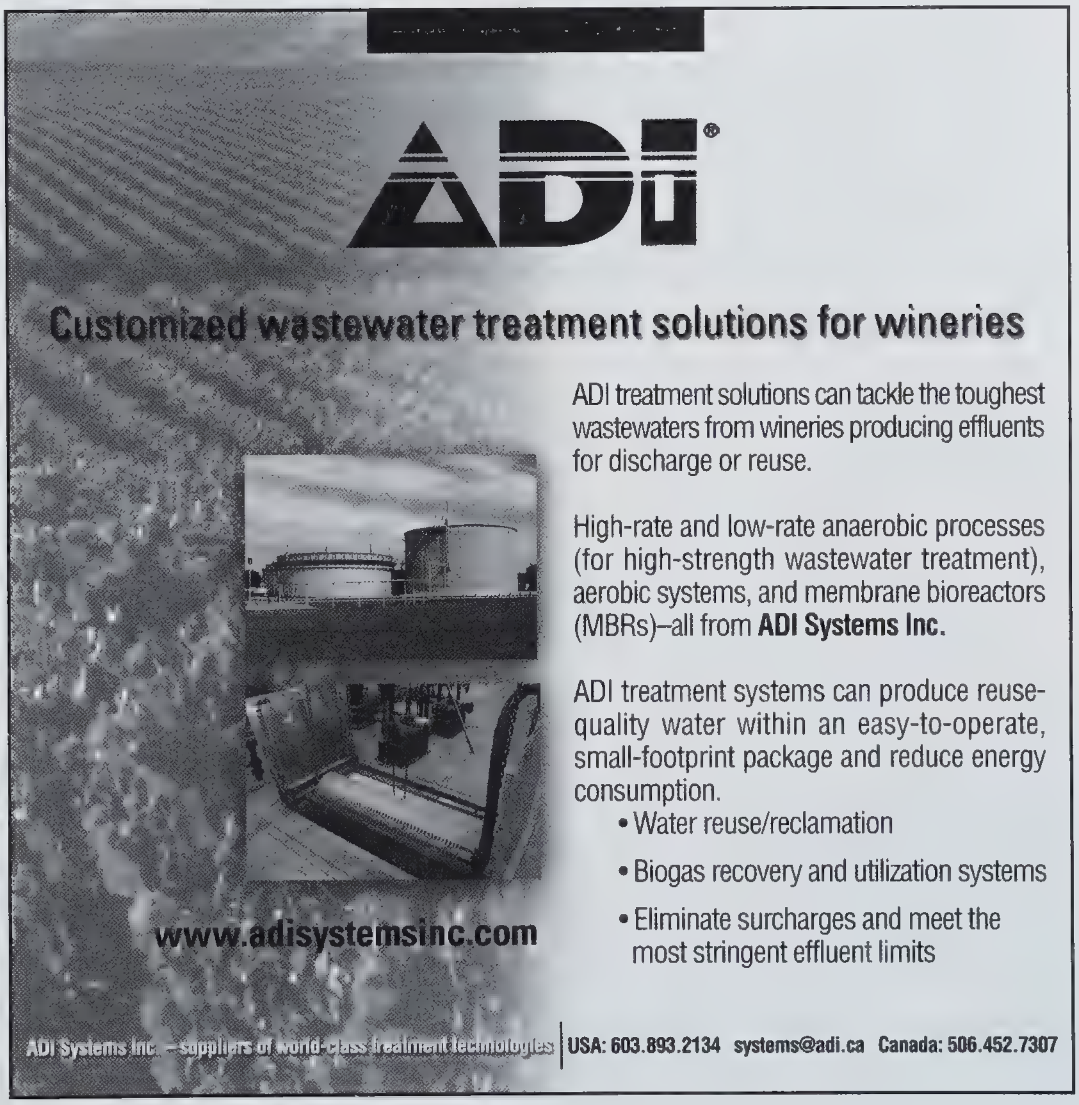


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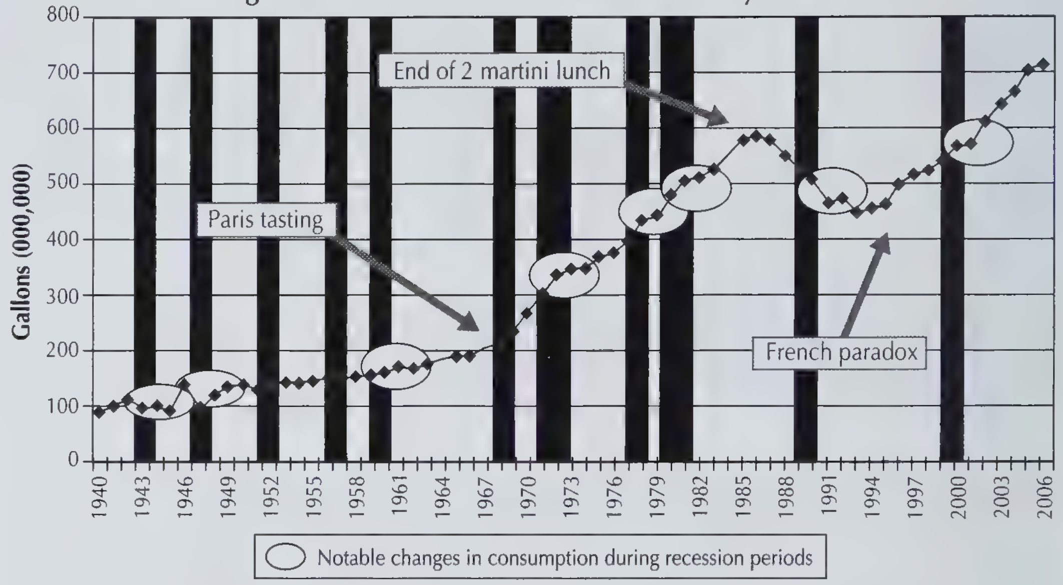
Figure F: Growth in domestic wine sales by volume



Source: Wine Institute, National Bureau of Economic Research

Clearly, pricing decisions this year will follow the patterns mentioned above and are already being impacted to some degree by the fears of a recession. To better understand what might happen if a recession is prolonged, a look at past recessions is helpful.

In Figure F recession periods are highlighted by the vertical bars. Most of the recessions correspond with a change in the direction of the slope of consumption. Since the chart is volume-based, the U.S. dollar-based sales changes are likely more severe in those periods, particularly if the industry started the recession with an oversupply.

SVB proprietary data provides a more refined view of recent history in fine wine sales, particularly with respect to the last recession, which began in March 2001. SVB Peer Group analysis data showed that sales growth dropped from the low- to mid-20% range in 2001, down to about 5% for the fiscal year ending in 2002. Those numbers do not necessarily mean that sales dropped.

In fact, overall sales for wine have continued a long-term and consistent growth pattern since the mid-1990s. The sales growth rates did drop; however, the sudden change in demand is important to consider in an industry that has to forecast demand 9 to 18 months in advance.

Current sales trends reveal consumption behavior suggesting we are already in a recessionary pattern. Figure G shows the purchasing patterns of consumers in the 52 weeks ending Feb. 9, 2008. That growth, which had been in the 20% range above $15 last year, has slowed for this period, and the consumer sweet spot has narrowed to the $9 to $15 price range.

SVB Peer Group Analysis has yet to see this decrease in growth rates, but the pattern shows pain will be first felt at the retailer level. It is possible that re-orders have yet to slow in the wine industry, and our data from FYE 2007 simply do not yet reflect the slowdown.

Figure G
Trade Pulse scan data showing consumer purchasing patterns.

Price points	Growth rate
$ 0.00–$2.99	0.10%
$ 3.00–$5.99	2.30%
$ 6.00–$8.99	4.80%
$ 9.00–$11.99	13.60%
$12.00–$14.99	15.70%
$15.00–$19.99	6.40% *
$20.00+	11.90% **

* has been around 15%
** has been above 20% for some time
Source: Trade Pulse Scan Data

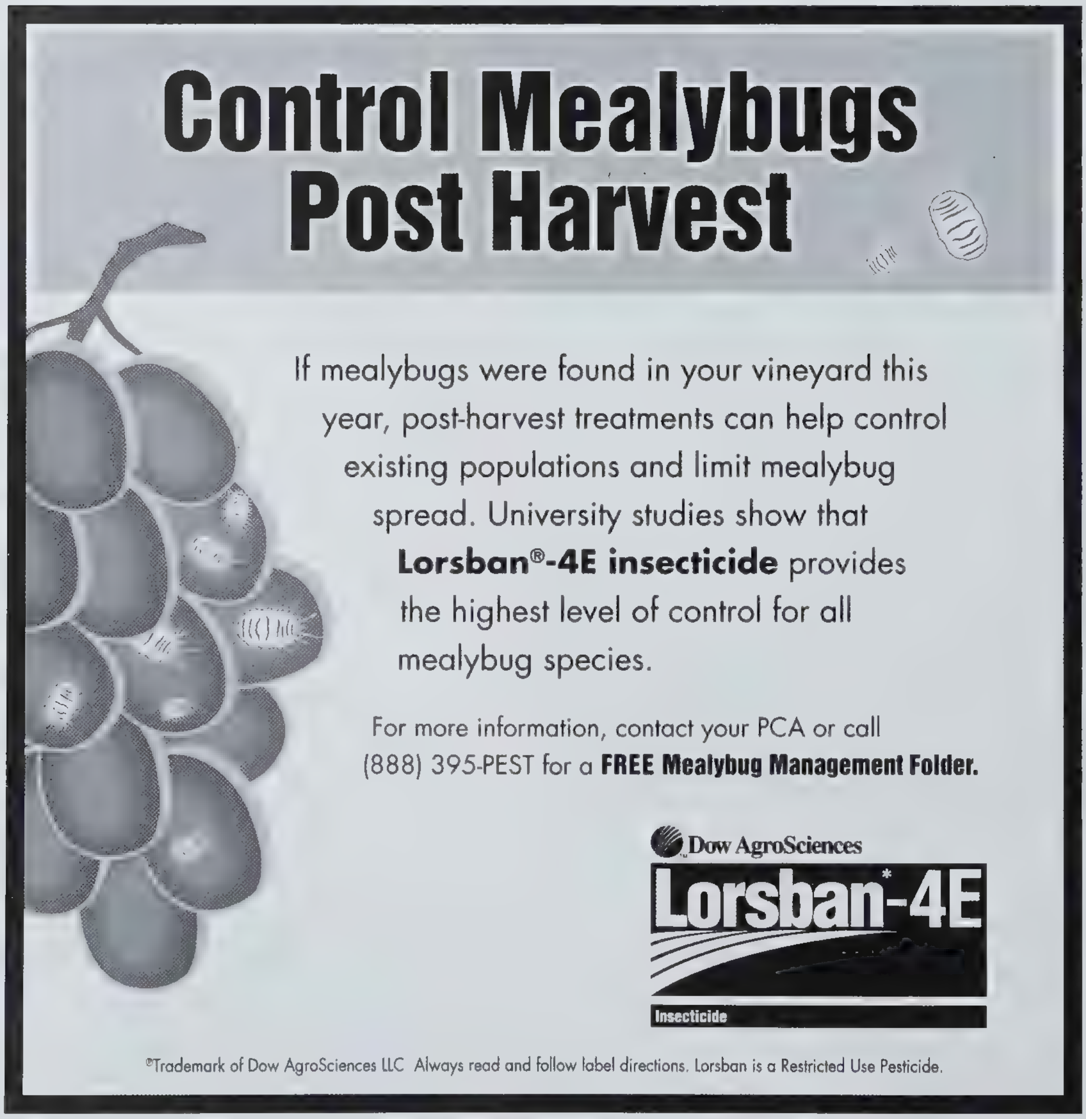

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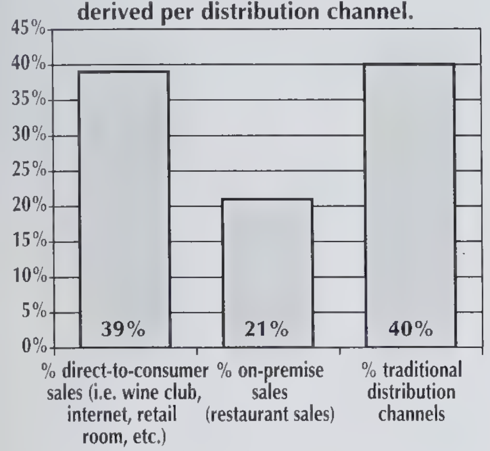
Figure H
Estimated revenue (sales) percentage derived per distribution channel.



Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

Restaurant wine sales

Restaurant sales may not be dead. It is not like a house fell on the economy or anything … or did it? However, the housing crisis, along with other economic shocks, has the restaurant trade at least checking its pulse. Since 21% of respondents to the SVB Annual Conditions Survey (see Figure H) reported that their sales are coming from on-premise accounts, perhaps it is worthwhile to check in on the patient — restaurant sales.

In a recession, purchase patterns favor "needs" over "wants." While people still "need" to eat during a recession, they may not "want" to frequent restaurants as often. High-end and independent restaurant sales suffer the most from the changed consumer patterns that are normally combined with reduced corporate business development expenses.

Hudson Riehle, senior vice president of research for the National Restaurant Association, says, "The weakness in the U.S. economy will extend at least through the first half of 2008. Fine dining in general mirrors the overall industry, so we expect to see a moderation in growth."[2]

According to restaurant analysts, starting in the summer of 2007 consumers began to shift their preference from fine dining establishments to quick service restaurants. In addition, the NPD Group, a consumer marketing research firm, found that fewer than 40% of meals purchased in restaurants are currently eaten on-premise.

Take-out food orders have a direct impact on high-end operations. If this trend continues, the on-premise sales of wine will shift more into direct or off-premise purchases for home consumption.

Countering the negative trends, *Nation's Restaurant News* forecasts that fine dining in major tourist destinations, such as New York City, will be better off than in many locations as a direct consequence of the weak USD, which is encouraging travel and entertainment.[3]

How long will a downturn be felt in fine dining? Analysis supports specific regional weakness in Nevada, Florida, Michigan, and California — all four

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also show among the highest mortgage default rates per household in the U.S.[4] This is particularly meaningful for West Coast wineries, as many sell a large percentage of their on-premise wines in California.

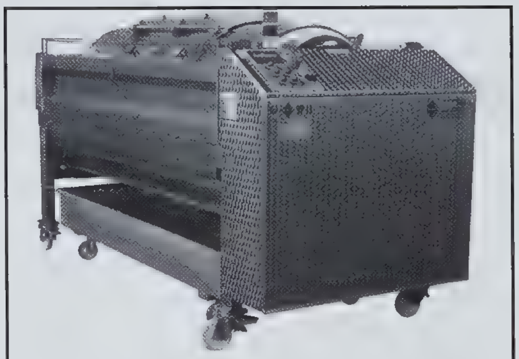
Furthermore, according to information from New Vine Logistics, more than 40% of consumer-direct shipments are made to California consumers.[5] During past cycles, restaurants have taken 22 weeks on average to recover from valley to peak. After the 2002 sell-off it took 46 weeks to recover from valley to peak, according to a Jefferies and Company report. This suggests that restaurant sales, particularly in California, may not recover to more favorable levels for more than a year.

As we review the impact of the changing economy, there is one major difference between the last two recessions and the current one. Supply is currently in balance or short in most major varieties. Consequently, *while we do expect the normal disruption as the venues of wine sales shift, we expect prices to hold better than during the past recessions, and imports will have a more difficult time filling demand gaps because of the weak USD.* The bottom line is that we believe the overall impact of a recession will be moderated at the winery level.

International wine sales

The international scene is a brave new world and there are scary levels of production and commitment from offshore producers that operate in largely stagnant markets. The 15-year steady growth in U.S. wine consumption has made these producers view the U.S. as the "Enchanted Land of Oz."

However, the U.S. has courageous wine producers eager to conquer new markets. The weak USD presents an opportunity for these ambitious entrepreneurs — the "lions and tigers and



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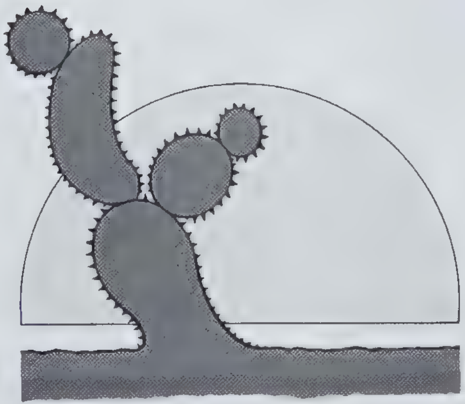

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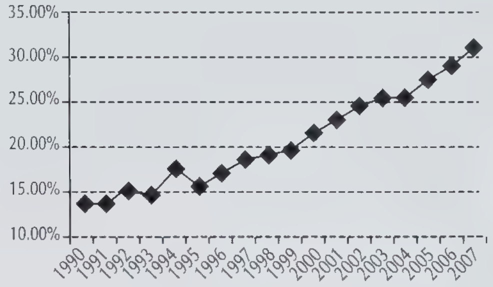
Figure I: Import share of U.S. market



Source: Gomberg, Fredrickson & Associates

bears” (India and China and Russia) are untapped markets for growth. While these are exciting prospects, they come with significant challenges.

Imports

While it would be natural to presume that the weak USD would lead to a drop in imports for fine wine, the exact opposite appears to be true of 2007 — a continuing trend that began in 1992. As of this writing, the Euro (EUR) was trading at all-time record highs to the USD, which is also weak against most importing countries. Yet, according to the consulting firm Gomberg, Fredrickson & Associates (see Figure I), *foreign wine imports have reached an all-time high of 31% of total U.S. wine sales while foreign wine companies work into higher price point segments and continue to penetrate this market despite the many obstacles.*

That said, the weakening USD is proving to be troublesome for importers, especially given more cautious buyers. Over the long term, if the USD remains weak and nominal pricing of foreign wine continues to climb, the increased cost of shipping may become so great that it will begin to deter imports. That may slow the onslaught of imports temporarily; however, foreign producers continue to make progress in this market when all the signs indicate they should not.

The U.S. wine market remains a top target market for importers. Any abate-

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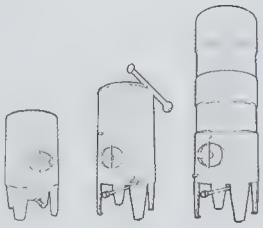

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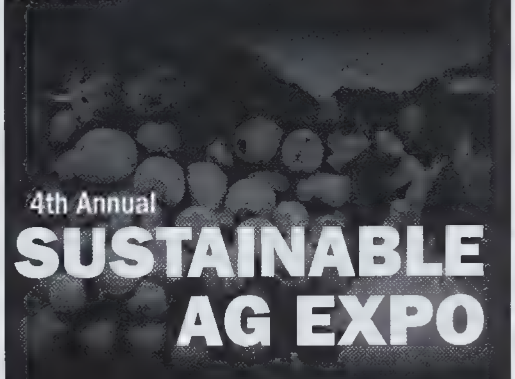

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ment in this trend will likely occur when the economic conditions in the U.S. improve. In the meantime, *we would not be surprised to see imports slow, which could provide more elbow room in the U.S. market for domestic producers.* It is an opportunity that should not be taken lightly.

Exports

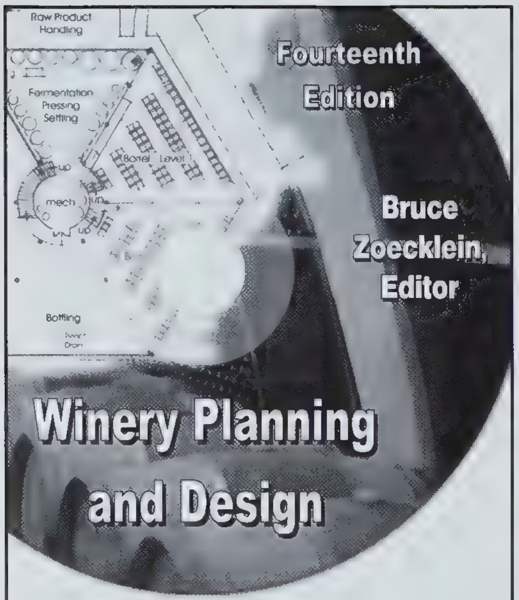
According to the Wine Institute, U.S. wine exports totaled $951 million and 453 million liters (120 million gallons) in 2007, an increase of 8.6% in value and 12% in volume, compared to 2006. Exports to Europe, where the U.S. ships more than half of its wines, totaled $474 million. Wine exports to Canada were $234 million, up 23% over 2006. The long-term trend of California wine exports shows steady expansion, with the 2007 number representing a 77% increase in exports by monetary value in the last decade.

Distributor consolidation prevents many wineries from getting proper representation, but the weak USD makes domestically produced goods a better value offshore, creating an opportunity for U.S. producers.

According to the 2008 SVB survey, irrespective of appellation, more than 40% of survey respondents wanted to start to export their wines out of the U.S.

Exporting in the fine wine business has become a hot topic in this industry segment. According to SVB historical data, this segment has exported less than 5% of its fine wine production. We are not implying that 40% of fine wine will be exported in the near term, but this amount may illustrate future distribution changes.

Wineries are beginning to evaluate and plan for the opportunity presented. That planning will have to include foreign consumers' acceptance of U.S.-made premium wine, distributor and importer relationships, country



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tariffs, and the travel cost of building and supporting a brand in a market that may have already been penetrated by Australian and European imports.

Bottle price mapping

At any given time, the market supports certain price segments over others. The favored segments are difficult to identify with precision, but in 2008 we believe there is a pattern emerging that is nominally descriptive. *What appears to be taking place is solid growth in the far ends of the spectrum: value-priced premium wines and very expensive premium wines.*

The results from both the SVB survey (see Figure J) and Trade Pulse scan data (Figure K) point to strong demand and growth in the $10 to $25 price range and in wines selling for more than $100 per bottle. A slowdown in restaurant sales and more cost-conscious consumers would seem to explain the lower trend. Strong brands, relatively few domestic choices, affluent buyer behavior, and direct sales of allocated wines are likely explanations

Figure K: Inventory for 2008 sales

Overall we ______ inventory for our anticipated sales demand in 2008.	Bottle price						
	<$10.00	$10.00–$14.99	$15.00–$24.99	$25.00–$39.99	$40.00–$64.99	$65.00–$99.99	>$100.00
have way too much	0%	0%	4%	1%	2%	3%	0%
have a little too much	0%	14%	17%	20%	11%	27%	0%
have just about the right amount of	0%	61%	49%	49%	52%	33%	27%
are a little short on	0%	25%	30%	24%	18%	21%	45%
are going to be very short on	0%	0%	1%	5%	16%	15%	27%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

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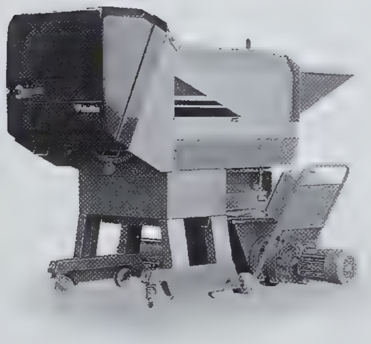

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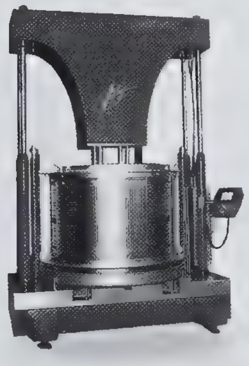

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Figure K: Sales growth by price

Price points	Growth rate
$ 0.00–$2.99	0.10%
$ 3.00–$5.99	2.30%
$ 6.00–$8.99	4.80%
$ 9.00–$11.99	13.60%
$12.00–$14.99	15.70%
$15.00–$19.99	6.40%
$20.00+	11.90%

Source: Trade Pulse Scan Data (February 2008)

for the strength in wines priced above $100. *The $65 to $100 segment appears to be particularly troublesome and is not delivering intuitive results.*

This segment, characterized by a higher percentage of on-premise sales and a relatively higher number of SKUs is an area where you find strong, well-known brands alongside brands that are trying to get traction and leading with limited-production wines. Without the pull from restaurant sales or strong ratings for those players, this will probably remain an undefined and risky price segment graced with both star performers (from wineries with well thought-out and executed sales strategies) and disasters.

In the 1990s, the dominant competitive issue was making good wine. If you made good wine and were able to attract good ratings, you would sell your wine. Since the early 2000s, the dominant competitive issue has changed. Today, you can make great wine or average wine and still be successful or unsuccessful.

The dominant competitive issue is a winery's ability to market and sell its wine effectively.

Industry profitability

In 2007, the wine glut storm was just leaving California's Central Valley, while, in the fine wine segment, there is currently a new storm marked by falling restaurant sales, distributor consolidation, increased prices for components like grapes and French oak, and changing consumer preferences. Sounds gloomy, does it not? Perhaps, but we are confident it will not feel as bad as the 2001 recession.

High-volume production

Wine is one of the few consumer products with a demand curve that is considered a commodity at one end of the curve and also considered a luxury good at the other. Growers in the high-volume end of the grape growing industry, primarily located in California's Central Valley, have suffered through several years of poor returns as large-scale wine companies extended their traditional sourcing to include foreign bulk wine, replacing grapes historically purchased from domestic growers.

Combined with declining demand in the lowest priced wines and a large crop in 2005, the market was over-supplied with grapes that did not always find a buyer. Since the start of the last

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recession, over 100,000 acres were permanently removed from production.

Circumstances have changed for the better in 2008 since increasing overall demand has lowered inventories in the tanks, and the outsized drop in the value of the USD has increased the cost of internationally-sourced wine.

Along with several programs that focus on increasing quality and differentiation from grapes destined for higher volume wines, there is some hope among many Central Valley growers that grower profitability may be sustainable at least for the short term. Several knowledgeable industry sources have cautiously suggested that planting the right varieties in the right locations (as long as you have a contract) may be warranted.

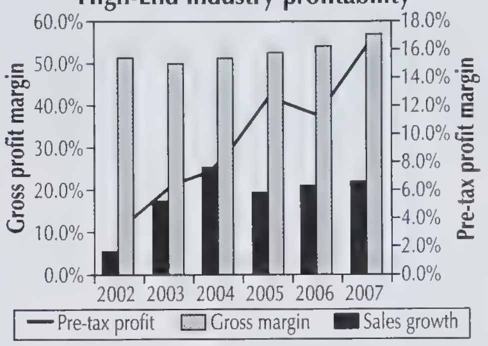
Fine wine production

The fine wine segment has experienced entirely different conditions. For the past four years, it has shown a strong rate of growth and profitability, and 2007 was no exception as gross margins and pre-tax profits reached a cyclical high point from the last recession.

There are exceptions in a market that is increasingly more difficult to navigate successfully. There is a wider range of results, with some wineries doing exceptionally well and others not doing well at all. As we noted earlier, the "average winery" is difficult to define and hard to find these days.

Given the SVB market share of premium wine clients, we are able to construct reasonable industry profitability metrics using our proprietary Peer Group Analysis metrics (see Figure L). This database includes West Coast wineries with an average bottle price of about $33 retail and case production ranging from 5,000 to 250,000 cases.

Figure L
High-End industry profitability



Source: SVB Peer Group Analysis

The fine wine segment in 2007 continued to show sales growth at a rate of approximately 20%, with accrual pre-tax profitability and gross margins reaching cyclical high points of 17.3% and 57.3% respectively (Figure M). The improvement in margins is due to lower overall grape costs from the large 2005 harvest and those wines now reaching the market, combined with slightly higher average selling costs.

Overall, pre-tax profitability was enhanced late in 2007 with declining short-term interest rates, which are vital to this asset-intensive industry.

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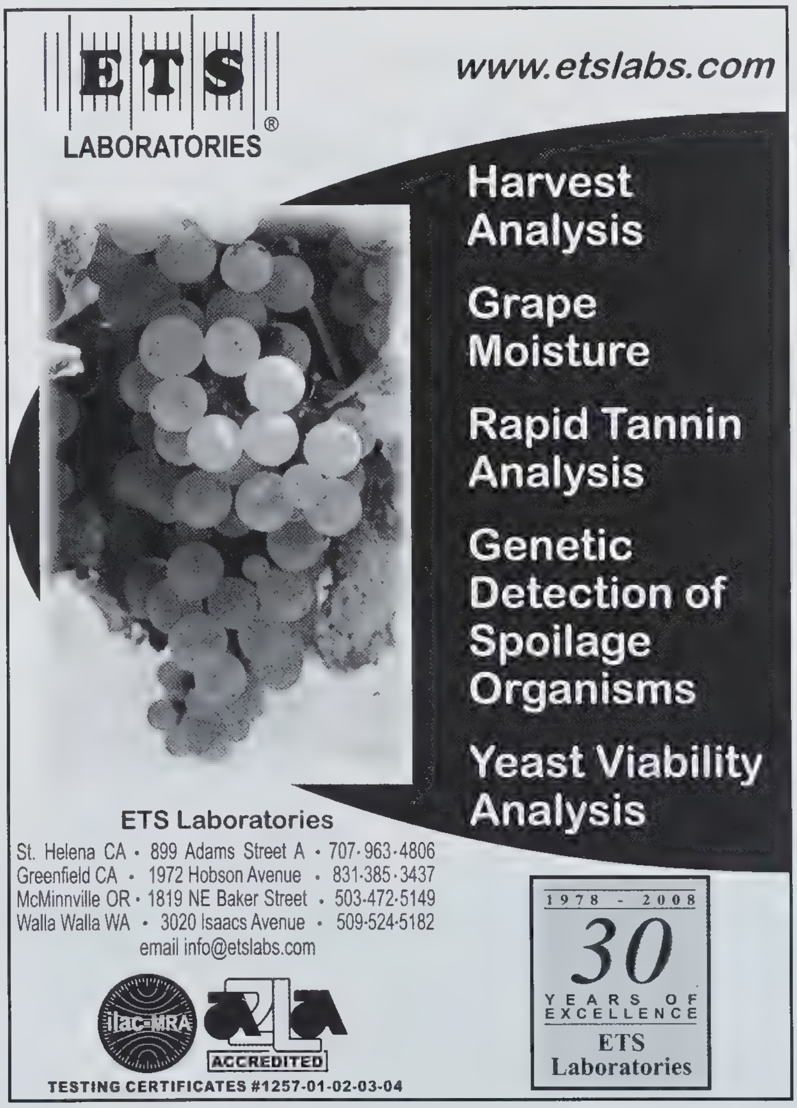
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Figure M: Profitability of fine wine segment

	2002	2003	2004	2005	2006	2007
Sales growth	5.20%	17.60%	25.50%	19.40%	21.20%	22.30%
Gross margin	51.50%	50.20%	51.50%	52.80%	54.50%	57.10%
Pre-tax profit	3.20%	6.30%	7.60%	12.60%	11.30%	16.30%

Source: SVB Peer Group Analysis

Figure N: 2007 performance

	Case production						
In terms of overall business success, 2007 was ________.	1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
our best year ever	31%	41%	38%	33%	48%	43%	21%
a very strong year	18%	27%	38%	35%	30%	30%	53%
an average year overall	39%	18%	19%	20%	8%	26%	5%
a slight disappointment	8%	14%	5%	12%	15%	0%	21%
very disappointing overall	3%	1%	0%	0%	0%	0%	0%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

According to SVB survey results, the increasing costs for barrels, fuel, stainless steel, and grapes will likely reduce 2008 profitability. *Furthermore, most wineries say they cannot increase price, creating a cost squeeze on margins.*

As noted in Figure N, more than half of the respondents to SVB's January 2008 survey report that 2007 was their best year ever. This is consistent with the SVB Peer Group Analysis results.

Figure O reveals that expectations for lower-priced or lower-volume producers are not as robust as the higher-volume and higher-average-price-point producers. In our experience, ***the most difficult business models are producers that make fewer than 10,000 cases and produce wines with average price points below $30,*** unless they have advantages of cost that can be discovered in appellations that have lower-priced land.

Based on higher component costs (such as barrels, stainless steel, and increasing grape prices) and the decreasing fine wine sales velocity, we predict 2008 will be a good year, but not quite as good as the past several years.

Distributor consolidation

Large-scale distribution companies continue to act as if they own half of

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Figure O: 2008 performance prediction

At this point, I believe 2008 will be ________.	Case production 1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
perhaps our best year ever	36%	33%	38%	35%	38%	22%	21%
a very strong year	34%	38%	38%	41%	33%	35%	41%
about an average year in terms of overall success	26%	24%	22%	22%	28%	35%	21%
a slight disappointment	4%	4%	3%	3%	3%	9%	17%
very disappointing overall	0%	1%	0%	0%	0%	0%	0%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

the market, and want to run the rest of it. On one hand, they are less and less interested in small-size vintners, and on the other hand, they support lobbying groups that limit free trade under the guise that they are protecting minors against the evils of the products they distribute.

There are varying statistics regarding the number of brands in the U.S. and the number of distributors selling those brands. In part, this is because the number of brands increases almost daily and distributors are continuously consolidating. This is a trend that is continuing, and is unlikely to abate soon.

The most recent available data report there are 4,929 U.S. wineries producing, conservatively, about 7,000 brands. Those brands have to squeeze through an estimated 600 distributors — half the number of 10 years ago — or find alternative distribution channels to reach the roughly 76 million wine consumers in the U.S.

According to estimates from Gomberg, Fredrickson & Associates, the top 10 wine companies account for 82% of total domestic shipments. Therefore, the other 4,919 wine companies have to compete for the remaining 18% of available space in wholesale channels.

While there are numerous startup distributors trying to pick up the pieces and the brands left in the cold after a merger, those distributors are often under-capitalized and have to fight for accounts against the larger distributors that have more influence with retailers.

The practical impact of this channel constriction takes two forms (see Figure P). Distributors seek producers with higher-volume production that is more efficient to sell, or they seek wineries with high scores or established brands that pull product through their accounts at a higher margin to the wholesaler without the dis-

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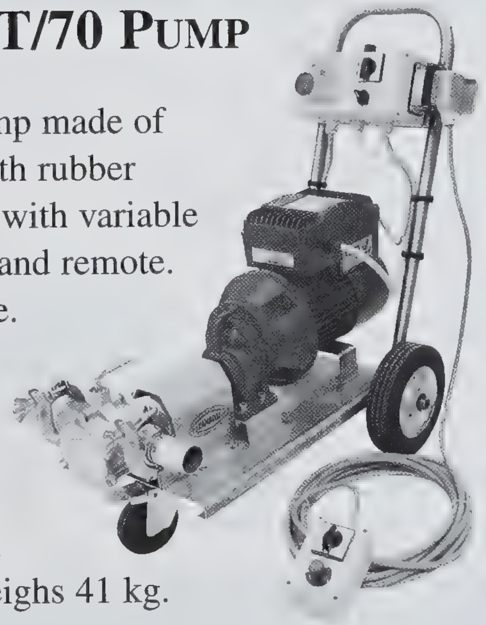

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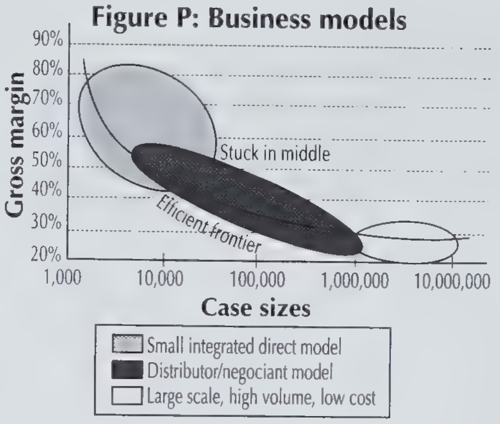
Figure P: Business models



Source: SVB Analytics

Figure Q: Pricing power of wineries

We plan to ______ in the next 12 months.	Case production 1–1,000	1,001–5,000	5,001–10,000	10,001–25,000	25,001–50,000	50,001–100,000	>100,001
keep prices mostly unchanged	68%	57%	45%	34%	48%	57%	38%
increase prices less than 3%	9%	15%	23%	29%	18%	30%	31%
increase prices between 3–8%	16%	18%	24%	33%	30%	13%	24%
increase prices by more than 8%	3%	7%	8%	4%	5%	0%	7%

Source: Silicon Valley Bank's Annual Wine Conditions Survey (March 2008)

tributor dedicating time to the sale. It is a daunting task for a small producer and most find they have zero pricing power with distributors, given the multitude of competitors willing to replace them.

This is causing rapid structural changes in the industry. When SVB began its dedicated wine practice in 1994, it was common to see successful models in nearly all volume segments and price points. Micro-brands seemed to thrive right along with estate operations and 50,000 case wineries. There have always been some more successful than others, but the opportunity was there to manage a small winery in a marginally profitable manner.

Today, the landscape is evolving due to consolidation of distribution, high growth rates in fine wine, changing buying patterns of younger consumers, the Internet, and the evolution of the private equity industry supporting M&A activity in the wine business.

Figure Q represents the pricing power the industry believes it has now. A winery that produces between 10,000 and 100,000 cases has a choice to make. It can try to continue to fight the tide of distributor consolidation (a workable solution for many established brands), it can be acquired and rolled up into a larger brand, or it can shrink lower-priced labels that are more fitting for a higher-volume producer and sell more direct at higher margins. This situation is creating winners and losers.

Not surprisingly, the SVB survey found that smaller wineries (less than

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10,000 cases) are less optimistic about their ability to raise prices. Many wineries producing under 10,000 cases are entirely shut out of distributor markets, and are evolving their direct approach as quickly as possible.

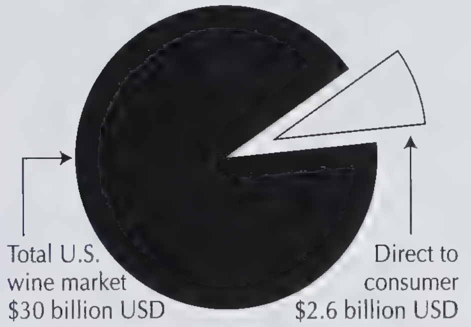
Wineries producing between 10,000 and 25,000 cases are the most optimistic about their ability to raise prices today. A closer look at the data reveals that many of those wineries sell at higher price points and have established brands. More than likely, this segment comprises more allocated direct-to-consumer models. Unfortunately, fine wine producers are faced with a mountain of compliance issues to ship direct, and a cold shoulder from the national distribution system.

CONSUMER DIRECT SALES

National background

The repeal of Prohibition put a stake in the heart of the Wicked Witch of the Temperance Movement, and the 2005 *Granholm* Supreme Court decision was to be a day of independence for all wineries throughout the land, as they were to be unleashed from the bondage of Neo-Prohibitionists. There was singing and dancing in the streets as consumers could finally have their favorite Pinot Noir delivered directly to their door — but wait, not so fast. As the Wicked Witch herself said, "These things must be done delicately," and painfully slowly, we might add.

Figure R
2007 total U.S. wine market $30 billion USD, direct to consumer $2.6 billion



Source: Stonebridge Research

The three-tier system was established by numerous states after the 18th Amendment to the U.S. Constitution was repealed by the 21st Amendment in 1933. For decades, the wine industry grudgingly went along with the new model, but only in the last 20 years have there been increasingly successful efforts to overturn provisions in the state systems that prohibited direct shipment of wine.

The most recent major ruling was the 2005 *Granholm* decision, which began a cascade of state actions that created new market access for wineries, but also created heavy compliance and regulatory obstacles. Combined with the advent of the Internet, the game for the small winery today is direct-to-consumer, direct-to-trade, wine club, and tasting room sales.

Stonebridge Research estimates that the direct-to-consumer portion of the U.S. wine market represents only about

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3% of the market (see Figure R). For the fine wine market, that number is much higher. The SVB survey revealed that nearly 40% of sales are currently from direct-to-consumer efforts.

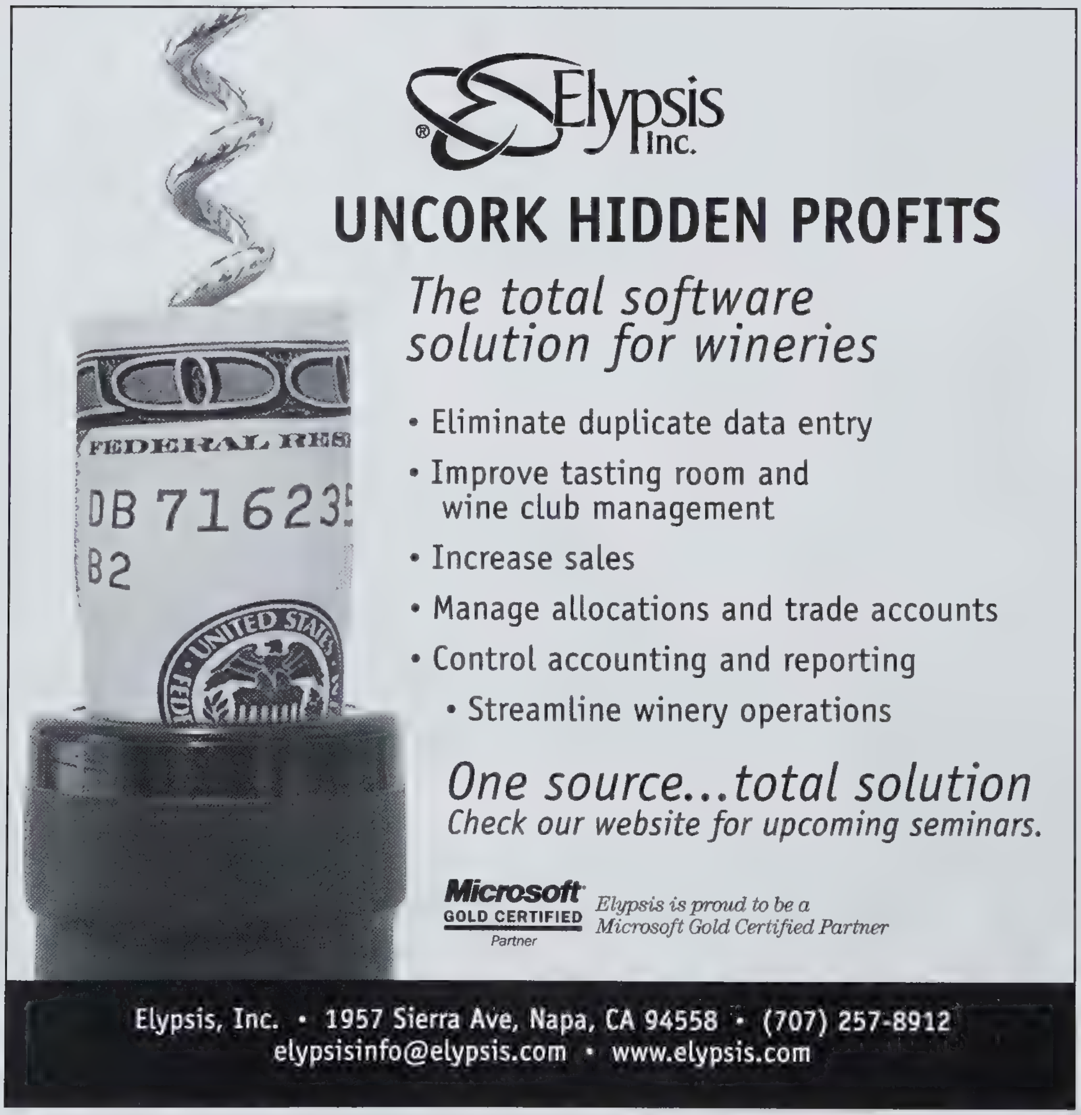
On the surface, it appears that the direct sales route is the solution, yet significant issues exist.

Many winery owners find themselves inexperienced and overwhelmed by Internet-based consumer marketing and sales tactics. It is a huge challenge for wineries to keep up with the continuously evolving e-commerce trends as service-providers develop new and exciting programs and procedures almost weekly. Owners have to adapt to the changing market while they adopt emerging tools and evolve their direct-sales strategies. On top of all that, they also need to worry about regulatory compliance.

Although more than 37 states allow direct shipping today, laws change daily. According to New Vine Logistics, if a winery shipped a case to each of the 37 states that are presently open to all winery forms (as of March 2008), just remaining in compliance with the existing sales, excise, and state taxes would require the preparation and submission of 725 separate forms.

In addition, while there seems to be an endless and growing supply of consumers willing to buy fine wine online, the Internet makes direct marketing more of a challenge by making price and quality comparisons for consumers easier than ever. This means increased market traction for foreign producers, resulting in more competition for the high-end domestic producer.

According to the Wine Market Council's 2007 report on consumer trends, 45% of Generation Y consumption is from imported wine, as these consumers are more likely than older generations to try new things. The downside of Generation Y's open-mindedness is that they are less likely to be brand-loyal.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Operational reality

According to Inertia Beverage, there are currently six major barriers to executing a consumer-direct sales model successfully:

- Lack of trained experts,
- Lack of a consumer direct plan,
- Lack of time and resources,
- Limited database of consumers,
- Compliance with state and federal regulations, and
- Disparate and nonexistent customer relationship management (CRM) databases.

While many wineries are attempting to invest in personnel and tools to capitalize on new sales opportunities, *we frequently find that small fine wine producers are simply stuck in the past. They are enslaved in habits of being in too many markets with too many distributors, or managing their club sales without any knowledge of their customers' preferences.*

Building a website is not e-commerce, as many believe. For years, when we ask clients and prospects about their websites and online sales, we often receive answers such as, "I have a friend who updates my site for free," or, "We don't have a shopping cart but people can fax us."

Just having a website does **not** result in sales. Internet sales require the same marketing effort as traditional wholesale marketing, if not more. Getting buyers to your website, understanding their preferences, managing their information, and creating a positive experience are vital to an Internet-based wine marketing and sales plan. According to Inertia Beverage, based on its experience a simple plan can increase consumer direct business 30% to 1000%.

Summary

Certainly the wine companies of the world know there is no place like home, and they are ready to move into yours. We have truly become an industry that can no longer only look to our own backyard. Offshore producers and component suppliers present both a threat and an opportunity, but that is not the end of the turbulence pounding at the doorstep.

The fine wine industry will need to deal with a recession concurrent with a cost squeeze, as increased prices for raw *materials will not be passed on to consumers at most price points easily.*

Getting to market will continue to be a large problem as there are fewer willing distributors on the one hand, and costly and evolving direct sales models and regulatory obstacles on the other. The good news near-term is that the wine supply, for the most part, is in balance and will moderate the volume bulge that generally characterizes the start of a slower economic period.

In the long term, there are additional challenges to face. Joint research conducted by Silicon Valley Bank and Scion Advisors (see *PWV* May/June 2008), suggests that 51% of family-owned businesses in the industry will change ownership within the next 10 years. This is going to result in a "brain drain" at the very time that experience may be needed the most.

Recommendations

How can you protect your label from getting ripped off its foundation? With a cost squeeze comes a greater need to manage costs. For many, that means investing in better accounting systems, upgrading personnel, and mining better information from reliable business partners to assist you in making good short- and long-term decisions.

There is a lack of understanding in the area of cost accounting and the application of costs in pricing decisions and profitability modeling. For the vast majority of producers, a deeper level of commitment to understanding the real and burdened costs of production is needed to ensure the wines being produced are generating an appropriate margin.

While there is not much that can be done about increasing component costs, there are measures you can take to better protect your margins. For example, those who use French oak should be using foreign exchange hedging strategies as a standard operating procedure. In addition, producers who buy grapes need to ensure

THINK Profitability

BY Vivien Gay,
Founder and CEO Vinum Global,
Berkeley, CA

When it comes to margins everyone is feeling the squeeze. Producer costs are rising more quickly than the market can absorb. This year, many domestic producers will face higher costs for their fruit, as well as for bottles, labor, and shipping.

Import pricing is skyrocketing in direct proportion to the plummeting dollar. Wholesalers find themselves caught between corporate producers' volume demands and the big chain buyers' pricing pressures. Small retailers and restaurants have had to reevaluate their traditional models, at times compromising on margins to compete in an environment where consumers have immediate access to competitive pricing information.

This is a complicated picture with every level of the industry feeling competitive pressures. One way around the margin squeeze is to shift your focus to overall profitability. At the most basic level, this means moving beyond competing on price alone, and investing in developing solid value-based positioning for each brand.

Our Vinum Global portfolio, for instance, features brands at a variety of price points, each of which delivers superior quality in its category, with a distinct market position in terms of the story behind the wine, the varietal expression, and its place of origin. We have also made a significant commitment to ultra-premium wines, where even with lower margins, the brands deliver much greater profitability per case than wines that retail under $25 per bottle.

This approach takes more thought and legwork than selling on volume at the fighting varietal level. It also takes us back to our roots in the wine industry, where for many of us it was our passion for fine wines that first brought us into the business and it's our love for the small, independent wineries that keeps us engaged and enjoying the fruits of our labors. ■

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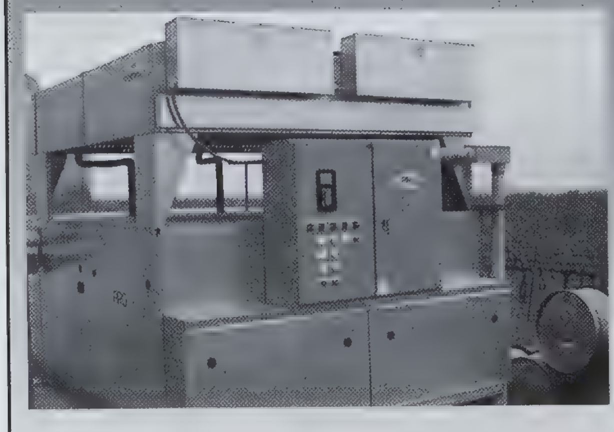

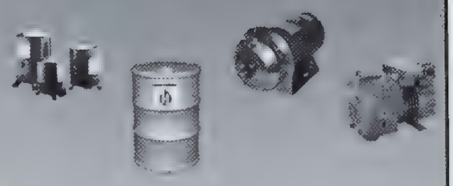

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their best-margined and most important grape sources are locked in long-term contracts to avoid price and availability problems.

Finally, the ability to adapt and take advantage of any sales opportunity that comes along is essential. With shrinking distribution, increasing direct opportunities, and export markets opening, there are certainly as many opportunities as there are threats for a calculating and informed risk-taker. Diligent strategic planning is recommended to weigh the risks and plot your own course to an optimum solution. ■

Appendix

Silicon Valley Bank's Proprietary Peer Group Metrics — Silicon Valley Bank's Peer Group Analysis program is a benchmarking tool that SVB developed to track and compare a variety of financial measures among premium wineries. Due to the company's niche focus and significant market share of premium wineries, it is able to develop meaningful benchmarking information, and it makes the data available to its clients. The data, based on financial information from over 100 premium wineries over several years, also allow Silicon Valley Bank to monitor industry trends.

Statement of the Obvious — We would be remiss if we did not mention that the above comments amount to our educated guesses and are for informational purposes only. SVB recommendations, too, are just our opinions. No forecast is 100% correct, and no data are perfect.

Furthermore, our predictions are based on generalizations about the average winery. (Of course, we know there is no such thing as an average winery.) Each winery has a different financial situation, a different model, and different competitive pressures; each needs to evaluate its strategy with that in mind. Nevertheless, we hope this dialogue helps you plan and evaluate in the coming year.

1. Wine Market Council's 2007 Consumer Tracking Study.

2. "Upscale operators face not-so-fine predictions." *Nation's Restaurant News*, January 14, 2008.

3. "Fine Dining: Dressed down (The NRN 50 The Survivors)." *Nation's Restaurant News*, January 28, 2008.

4. Jefferies & Company, Inc., "State of the Growth Restaurant Union: Seeking Fundamental Inflection Point," March 2008.

5. New Vine Logistics, "Market Trends in the Consumer-Direct Distribution Channel." *The Grapevine*, February 12, 2008.

Continued on page 77

PG&E studies electrodialysis for cold stability

BY Steve Fok, PE
Pacific Gas & Electric Co.

California's 1,100 wineries produce 500 million gallons of some of the world's finest wines. In the process, they consume around 400 gigawatt-hours (GWh) of electricity every year — the equivalent of powering almost 60,000 homes. More than 25% of this electricity is spent on clarification-stabilization, the final step in which tartaric acid is reduced through energy-intensive refrigeration.

As an alternative to refrigeration, some winemakers are using electrodialysis, a technology developed in Europe in the early 1990s. The titratable acidity (tartaric, citric, malic and ascorbic acid concentrations) is unchanged. Potassium bitartrate and calcium tartrate salts are removed from solution.

Pacific Gas & Electric Company (PG&E) commissioned two studies at California wineries, with the goal of determining the most energy-efficient methods to stabilize wines. The first study, which took place at Fetzer Vineyards (Hopland, CA), compared the energy consumption of electrodialysis to that of cold stabilization. The second study compared the energy efficiency of cold stabilization at Fetzer Vineyards to that at another site, where cold stabilization was enhanced by seeding, using insulated tanks, and other factors.

Despite using more water, the electrodialysis process was found to be up to 99% more energy efficient than cold stabilization, using eight watt-hours (Wh) per gallon to stabilize the wine versus 22 to 1,200 Wh per gallon for the cold stabilization process (whether tanks are insulated or not). For uninsulated tanks, it is 95% of 1,200 Wh per gallon; for insulated tanks, it is 95% of 22 Wh/gal.

Energy efficiency of the cold stabilization process varied greatly depending on a number of factors, including tank insulation, wine type, seeding, and duration of stabilization. Electrodialysis was shown to maintain wine quality, reduce wine loss, and reduce processing time from weeks to days.

Electrodialysis stabilized wine in just a little over one day, while the cold stabilization system that included seeding and tank insulation required five days. The unenhanced cold stabilization system took a full 46 days.

PG&E and Fetzer Vineyards: energy efficiency partners

These studies are part of PG&E's Emerging Technologies (ET) program, which identifies, assesses, and brings to market the next generation of energy-efficiency solutions for Californians at home, at work, and in industry. ET works with a wide range of customers who have opened their homes or businesses to host these studies.

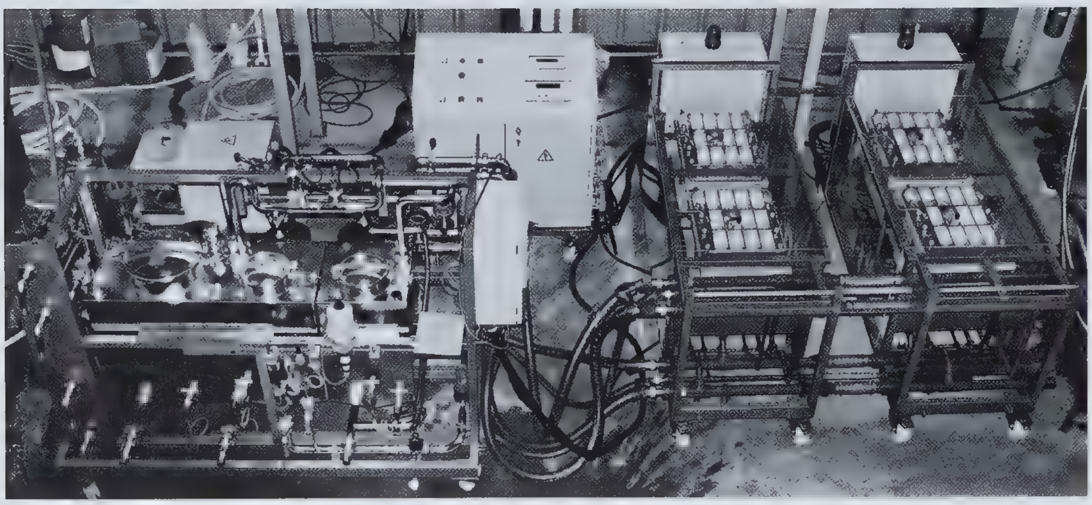
Working with PG&E, Fetzer Vineyards tested electrodialysis as part of the winery's goal of adopting innovative and sustainable viticulture and winemaking methods. The mobile trailer-mounted "STARS" ED unit was provided by Winesecrets (Napa, CA).

"We have been very pleased to participate with PG&E in this electrodialysis study," says Ann Thrupp, Fetzer sustainability manager. "As innovators in sustainable winegrowing practices, we hope this kind of information can be useful to others who are interested in saving energy and gaining efficiency benefits from new technologies."

Science behind tartrate stabilization

As the final step before bottling, stabilization reduces the concentration of potassium bitartrate (cream of tartar) in wine. For customers, this means no "wine diamonds" will be visible at the bottom of a chilled bottle of wine. Traditionally, this is accomplished by chilling the wine to around 27°F for a period of 1½ to three weeks, depending

Cold-stabilizing wine in un-insulated tanks is the least efficient method available, resulting in greater energy demand.



STARS ED-1600 electrodialysis unit on-site at Fetzer Vineyards. This unit, with a nominal flow rate of 1600 gallons per hour, was used for production-scale trials at Fetzer during 2007. Photo courtesy of WineSecrets.

on how quickly the potassium bitartrate is crystallized.

Several factors can influence this crystallization rate, including: 1) nucleation (the number of nuclei on which crystals can form and grow); 2) diffusion (the rate at which the dissolved potassium bitartrate comes into contact with the crystal formations); 3) the rate at which crystals grow; and 4) the grape variety.

There are three methods, or enhancements, that expedite the stabilization process:

Table I: Cold vs electrodialysis wine stabilization

	Cold stabilization	Electro-dialysis
Energy consumption	26,891 kWh	165 kWh
Average demand	24 kW	5 kW
Increase in water consumption**	baseline	3,010 gallons
Adjusted energy consumption*	22,965 kWh	170 kWh
Stabilization period	1,108 hours	31 hours
Initial conductivity drop	14.8%	14.6%
Final conductivity drop	3.4%	2.5%
Volume of stabilized wine	18,500 gallons	21,500 gallons
Energy intensity	1,200 Wh/gal	7.9 Wh/gal

* The adjusted cold stabilization energy consumption considers the added tank and bare pipe insulation. The adjusted electrodialysis stabilization energy consumption considers the extra energy needed for wastewater treatment. The energy consumption for the increased electrodialysis water consumption is based on the Secondary Wastewater Treatment (activated sludge system) Baseline Study.

** Cold stabilization uses water during clean-in-place and through evaporation; not measured for this study.

In the **Contact Process**, chilled wine is seeded with potassium bitartrate, which hastens the crystallization rate. The crystals left behind are ground and reused to seed the next batch.

In the **Filtration Process**, the wine is filtered through a potassium bitartrate bed where faster crystallization occurs. Wine is sometimes passed through this crystal bed several times until stabilization is reached.

In the **Crystal Flow Process**, wine is chilled to its freezing point, between 14°F and 21°F, which generates potassium bitartrate and ice crystals. These crystals act as nuclei for further crystal growth. This process requires the use of scraped-surface heat exchangers

There are various methods used to determine stability with respect to potassium bitartrate crystallization and they vary depending on the winemaker. Some of these methods include:

- Chill proofing followed by a Concentration Product test,

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- Chill proofing followed by visual inspection,
- Filtering at 25°F for 24 hours followed by visual inspection,
- Wine freeze/slush test,
- Conductivity test.

Electrodialysis — A technology with legs

In an electrodialysis system, tartaric acid is removed as the wine passes through an electric field and separates ions on anionic and cationic membranes. The ions are potassium (K+), calcium (Ca++), and negatively-charged tartaric acids.

In this electrical and chemical process, the cationic membrane allows positively-charged calcium and potassium to pass through, while the anionic membrane allows negatively-charged tartaric acid ions to be removed. One chamber holds the wine; a second chamber contains a solution of potassium and calcium ions that have been extracted by applying an electric field across the wine. Water flows through the second chamber, creating a brine solution made up of the potassium and calcium ions.

Electrodialysis technology is used in a variety of other applications, including seawater desalinization and food processing.

Table II: Study results: electrodialysis compared to cold stabilization

	Electrodialysis	Cold stabilization baseline First test	Cold stabilization Second test	Observations
Wine variety	Pinot Grigio	Pinot Grigio	Chardonnay	According to winery personnel, Chardonnay is easier to stabilize than Pinot Grigio.
Volume of stabilized wine	21,500 gallons	18,500 gallons	24,000 gallons	Electrodialysis reduces wine loss
Enhancement	n/a	None	Seeding	According to winery personnel, seeding reduces cold stabilization time by approximately one-third.
Increase in water consumption	3,010 gallons (14% of total wine volume)	0 gallons	0 gallons	Electrodialysis wastewater must be treated
Tank	n/a	Un-insulated tanks caused build up of ice, which required additional refrigeration.	3 inches of insulation	Ice buildup required additional refrigeration/more energy; separate study shows that insulation saves significant energy.
Wine temperature	n/a	Cooled to 28.5°F	Cooled to 31.4°F	Cooler temperature means more energy consumption
Average demand	5 kW	24 kW	4.4kW	
Stabilization time	31 hours (1 day + 7 hours)	1,108 hours (46 days + 4 hours)	122 hours (5 days + 2 hours)	
Energy intensity	7.9 Wh per gallon	1,200 Wh per gallon	22 Wh per gallon	

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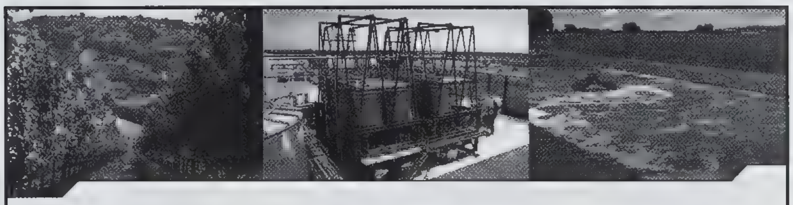
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Table III: Electrodialysis stabilization measurement points

Measured parameter	Logging method	Logging interval
Wine inlet temperature	data logger	15 min.
Wine outlet temperature	data logger	15 min.
Wine initial conductivity	winery personnel	Start
Wine final conductivity	winery personnel	End
Wine initial pH	winery personnel	Start
Wine final pH	winery personnel	End
Energy consumption of ED system	data logger	15 min.
Water consumption	winery personnel	1 per batch
ED pump on/off status	data logger	Varies

Putting electrodialysis to the test

From January through April 2007, PG&E's Emerging Technologies Group commissioned BASE Energy to perform a test at Fetzer Vineyards. This study assessed the electrical energy and demand savings of electrodialysis versus cold stabilization. For each method, around 20,000 gallons of 2006 Pinot Grigio were stabilized in uninsulated, indoor, jacketed stainless steel tanks. To accurately compare the electrical energy consumption of both systems, it was determined that use of the Conductivity Test, wine reaching 2.5% conductivity would be considered stable.

The study took into account many testing parameters, including electrical energy consumption, temperatures, wine tank levels, water consumption, flow rates, and wine conductivity. Each of these items were monitored and logged for the duration of the study. A detailed description of measurement points is described in Tables III and IV. The refrigeration required to keep the wine cool at its baseline temperature was not subtracted.

The electrodialysis system was portable and mounted into a trailer that was plugged into an electrical outlet. Wine was pumped from the fermentation tanks to the electrodialysis trailer and processed through as many loops as necessary to reach the desired wine conductivity. The cold stabilization system included a dedicated chiller supplying glycol to cool two 9,250-gallon tanks. The glycol was chilled through a 40 horsepower water-cooled reciprocating compressor and pumped to the stabilization tanks, which were located in a room kept at approximately 50°F. This study examined cold stabilization in its most basic form, with no mixing, seeding, or any processes that would otherwise speed the rate of crystallization.

First study — Cold stabilization hard pressed to match efficiency of electrodialysis

Results indicated that electrodialysis was significantly more energy efficient than basic cold stabilization, completing the clarification process with just 7.9 Wh per gallon of electricity versus 1,200 Wh for cold stabilization. In addition, electrodialysis resulted in demand savings — energy saved during the region's most energy-intense time periods — of up to 79%. Further benefits of electrodialysis included an increase in the stabilization rate and a significant reduction in stabilization time.

Table IV: Cold stabilization measurement points

Measured parameter	Logging method	Logging interval
Outdoor air temperature	data logger	15 min.
Barrel room ambient temperature	data logger	15 min.
Stabilization tank surface temperature	data logger	15 min.
Stabilization tank well temperature	data logger	15 min.
Wine temperature	winery personnel	2 per day
Stabilization tank level	winery personnel	2 per day
Wine conductivity	winery personnel	Varies
Wine pH	winery personnel	Varies
Glycol flow rate (at bypass pipe)	spot measurement	Once
Glycol supply temperature	data logger	15 min.
Glycol return temperature	data logger	15 min.
Cooling tower fan motor current	data logger	15 min.
Cooling tower fan on/off status	data logger	15 min.
Glycol supply pump power	spot measurement	Once
Condenser pump power	spot measurement	Once
Chiller compressor power (idle)	spot measurement	Once
Energy consumption of chiller system	data logger	15 min.

The electrodialysis system required two water lines. This water moved the brine solution after dialysis occurred and performed required system cleaning. Based on manufacturer specifications, the equipment can process wine

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for around 12 hours before it requires a 1.5-hour cleaning. After adjustments, the additional water used to stabilize the electrodialysis test batch was reported at 14% of the total volume of processed wine, or 3,010 gallons. Wastewater is released to winery industrial drains as with cold stabilization.

There were two hiccups during the test. The first was when the cold stabilization refrigeration system had to be shut down for repairs. Because of this breakdown, the actual stability duration was 63 days; however, to better reflect a more realistic time lapse, the net cold stabilization period was recalculated at 46 days (1,108 hours). The second glitch occurred when a glycol leak was detected in the refrigeration system. This was repaired and the cold stabilization test results were normalized to account for this short interruption.

Second study — Searching for more cold stabilization savings

Armed with information from the cold stabilization and electrodialysis assessment, and in an effort to learn how cold stabilization energy efficiency could be improved, PG&E commissioned BASE Energy to conduct another study (August/September 2007), which offers a comparison between the un-enhanced, baseline stabilization in uninsulated tanks at Fetzer with cold stabilization using seeding in insulated tanks at a second site. In the second test, seeded (or contact process) cold stabilization was performed on 24,000 gallons of 2006 Chardonnay in insulated, jacketed stainless steel tanks.

The second test showed that there is a significant difference in energy consumption in cold stabilization, depending on a number of factors including wine variety, enhancements such as seeding or filtration, tank insulation, and desired wine temperature.

One observation is that insulated tanks may significantly reduce energy consumption, which confirms another recent PG&E study. In addition, seeding and a slightly higher cooling temperature save energy also. In the end, these cold stabilization enhancements

Continued on page 88

EDITOR'S NOTE

The STARS equipment manufacturer requires that soft water (water containing little or no dissolved salts of calcium or magnesium) be used for the ED process, thus reducing water consumption from 14% measured in this study, to 7% to 8% on a normal basis.

In addition, WineSecrets operates a new water conservation module in tandem with the STARS unit, using reverse osmosis (RO) to recycle water used by STARS. The RO unit reduces water use to approximately 3% of treated volume, and the tartrate-rich stream is saved for recovery and recycling.

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250 attend first international O2inWines™ conference on oxygen management

Scientists, enologists, and wine professionals gathered at the Institut National de la Recherche Agronomique (INRA) in Montpellier, France, to participate in the international wine industry's first conference to explore the impact of oxygen in wine. O2inWines™, a nonprofit organization formed by Nomacorc, Lallemand, and G3 Enterprises, hosted the June 2008 conference that brought together more than 250 wine specialists from 18 countries to review new findings in the measurement, impact, and management of oxygen during the different stages of wine production.

"Because O2inWines involves innovation leaders from academia and industry, the participants can collaborate to promote effective solutions to oxygen management challenges," says Didier Théodore, Lallemand business support manager. "This will ultimately assist winemakers to improve wine quality and consistency by perfecting the control of oxygen at every stage in the winemaking process."

State-of-the-art research presented demonstrated that, although oxygen management is a complex subject, much progress is being made. However, the scientific results supplied by academic research must be "translated" and communicated to the wine industry. Therefore, the ultimate goal of the conference and the O2inWines association will be to bridge the gap between technology and knowledge, research & development, and the international wine industry.

The conference was presented in three sessions:

I Measuring oxygen and oxygen exposure,
II Understanding the impact of oxygen exposure,
III Controlling oxygen exposure during winemaking and wine preservation.

Dr. Stéphane Vidal (Nomacorc, Belgium) began the first session with an overview of the methods used to measure oxygen and reduction/oxidation. Several new tools to study these phenomena were presented, including:

BPAA oxygen measurement technique, which allows for accurate measurement of the dissolved oxygen in the bottle (Dr. Elizabeth Waters, Australian Wine Research Institute [AWRI]),

High-resolution GC/MS analysis, which allows for identification and quantification of the various aroma compounds in wine (Dr. Pat Sandra, Research Institute for Chromatography, Belgium),

Several high-resolution analysis techniques to qualify and quantify polyphenolic structures in wine (Dr. James Kennedy, Oregon State University, U.S.),

The electronic tongue to rapidly qualify wine composition and stage of evolution (Dr. María Luz Rodriguez-Mendez, University of Valladolid, Spain),

UV-VIS and near-infrared spectroscopy in combination with chemometrics data handling, which allows for rapid determination of various key wine metrics without opening the bottle (Dr. Bob Dambergs, AWRI, Australia).

The second session included:

Dr. Hélène Fulcrand (INRA Montpellier, France) gave an overview on the understanding of the various mechanisms that are involved in oxidation, highlighting the influence of oxygen on aroma development, taste/structure formation, and color changes of a wine.

Dr. Andrew Waterhouse (University of California, Davis, U.S.), provided in-depth explanations of the initial reaction steps in the oxidation process by demonstrating that a better understanding of these initial oxidation steps will provide useful insight into how to better control wine oxidation.

Dr. César Ferreira (Universidade Católica Portuguesa) presented his team's research on wine aroma development via oxidation in white and port wine. Compounds such as sotolon, phenylacetaldehyde, and methional were found to correlate with the level of dissolved oxygen. In white wine, they lead to a reduction in perceived quality. But in port wine, they lead to an improvement in perceived quality, which illustrates that oxygen ingress needs to be managed to achieve the desired level of quality based on the end application.

Dr. Véronique Cheynier (INRA Montpellier, France) discussed the many structures and reactions of polyphenols and how they can explain color, astringency, and bitterness changes of a wine.

Gérard Casaubon (Universidad Católica de Chile) presented a method to understand oxygen's influence on consumers' preferences for the aroma and taste development of commercial wines.

The third session focused on the practical aspects of winemaking and oxygen management including:

Dr. John Cunningham (G3 Enterprises, U.S.) presented a survey of California winemakers on where and how they measure oxygen during their winemaking that showed that the majority of the testing was done with only wine tasting and that quantification methods were scarcely used.

Dr. Anne Ortiz-Julien (Lallemand, France) addressed the oxygen demand by yeasts during wine fermentation. She illustrated the need for oxygen management via her research on oxygen additions during alcoholic fermentation and how these additions can lead to different fermentation kinetics, depending on the yeast's O_2 requirement.

Patrick Ducournau (Vivelys, France) discussed the need to manage oxygen dosing in the barrel ageing stage (micro-oxygenation) and stressed that, depending on the type of wine and winemaking style, the level of oxygen needs to be changed.

The bottling process is the last step in winemaking and has an important influence on the quantity of dissolved oxygen in the bottle, explained Dr. Rainer Jung (Forschungsanstalt Geisenheim, Germany). His studies focus on the best bottling conditions to obtain the optimal shelf-life.

Dr. Olav Aagaard (Nomacorc, Belgium) showed how to control post-bottling oxygen ingress into the bottle by means of the choice of closure. He illustrated the importance of being able to deliver oxygen consistently to the bottle and to measure the total oxygen package, which is the sum from dissolved oxygen, headspace oxygen, and oxygen transfer through the closure.

The success of the first O2inWines™ conference demonstrated that there is a lack of information on oxygen management, and additional knowledge is actively sought by wine producers. O2inWines™ will continue serving as a forum for academia and industry to come together by hosting additional conferences. The second conference, which will include updates on ongoing research, is planned for 2010.

Presentations from the First International O2inWines™ Conference on Oxygen Management are available from the O2inWines™ association (www.o2inwines.org). ■

About O2inWines™

O2inWines™ is an international non-profit association composed of suppliers and service providers to the wine industry, all leading innovators in their fields and heavily involved in researching oxygen management. World-renowned research institute and university members underscore the quality of the research programs facilitated by the association. The objective of the association is the promotion of scientifically based solutions for oxygen management challenges in the wine industry. O2inWines™ is based in Toulouse, France. For more information, visit www.o2inwines.org.

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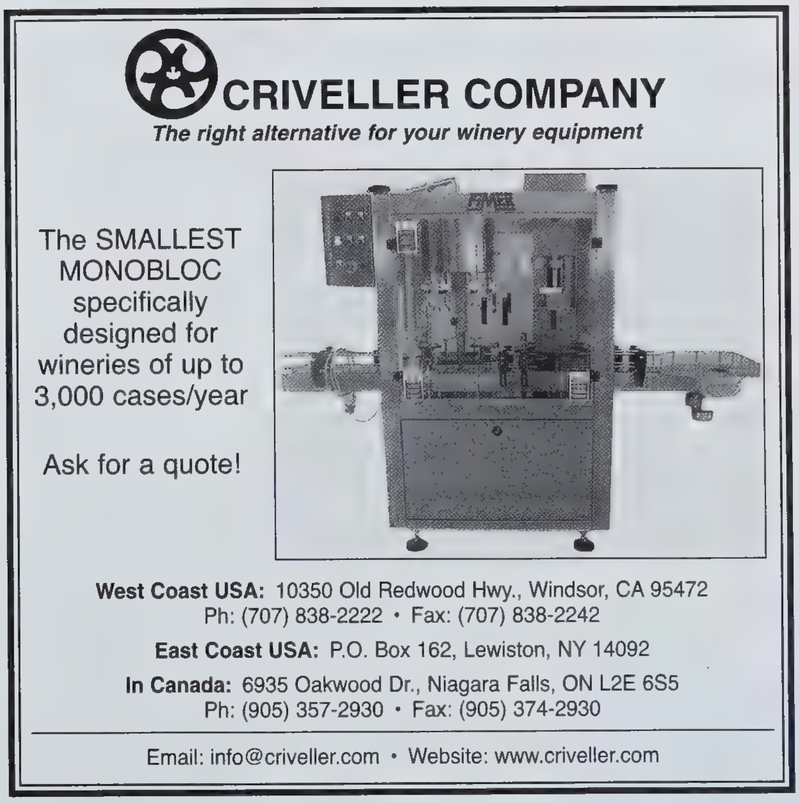
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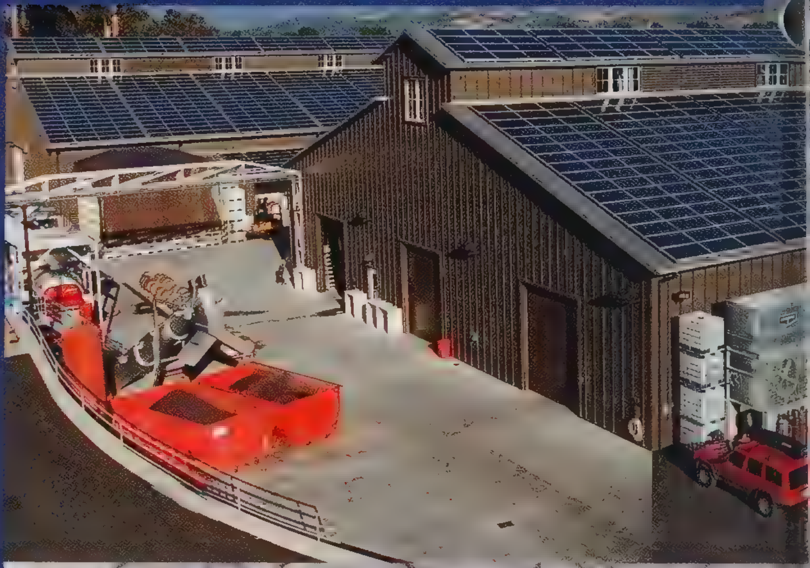

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INERTIA BEVERAGE GROUP

Inertia provides solutions designed to create healthy virtual markets for the wine industry. Inertia aims to connect winery supply with market demand, in a direct engagement, through proprietary technologies and innovative programs and services.

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The proprietary Direct-to-Trade (DTT) program provides wineries with a solution for selling direct to the trade, legally and efficiently, in full compliance with state regulations. Currently available in 12 states, Inertia's DTT initiative provides access to over 50% of the U.S. wine consumption marketplace.

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KENNEDY/JENKS CONSULTANTS

Kennedy/Jenks Consultants has provided consulting engineering services to the wine industry for more than 40 years. They specialize in:

- Planning, design, and construction management for improvements/expansions;
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- Land application systems;
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- Waste minimization/source reduction;
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- Sustainability and climate action plans.

Kennedy/Jenks' has a thorough understanding of current regulatory constraints and trends. With experience in designing treatment systems for large and small wineries in California and the northwest, Kennedy/Jenks can identify the most favorable, cost-effective alternatives to meet facility needs.

Kennedy/Jenks Consultants
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Kennedy/Jenks recently developed the *Comprehensive Guide to Sustainable Management of Winery Water and Associated Energy* on behalf of the Wine Institute and American Vineyard Foundation, in partnership with the National Grape and Wine Initiative. The Guide provides methods for wineries of all sizes to evaluate water-use operations; identify potential improvements; evaluate the feasibility of changes; and implement the selected improvements. Wineries are encouraged to consider their operations holistically, so that water use efficiency is achieved along with energy efficiency. Applying the approach detailed in the Guide and expertise in closely-related disciplines, Kennedy/Jenks is assisting wineries with planning for sustainability throughout their operations.

For more information, contact:
Kennedy/Jenks Consultants
Bob Chrobak, Vice President
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CIATTI COMPANY LLC

The Ciatti Company LLC is the wine industry's oldest, largest, and most comprehensive grape and bulk wine brokerage in the U.S. and internationally. Annual sales are over 110 million gallons (416 million liters).

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Scott Laboratories offers a variety of technical and processing services to wineries.

Scott's laboratory is the senior independent wine laboratory in North America and, since its founding in 1933, has provided analytical services to the wine and spirits industries.

SCOTT
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- STARS tartrate stabilization and pH reduction;
- alcohol adjustment/flavor balance;
- volatile acidity and ethyl acetate reduction;
- smoke and taint removal, 4-EG/4-EP reduction;
- wine and must concentration;
- wine clarification;
- tannin refinement.

WineSECRETS

American Winesecrets LLC has assumed and expanded operations for reverse osmosis-based technologies and alcohol adjustment services, at their new Sebastopol, CA facility. Services are available throughout California and most of North America, and include a range of filtration technologies such as volatile acidity reduction, alcohol adjustment, smoke and brett taint removal via reverse osmosis, tartaric stabilization and pH reduction using STARS, cross-flow filtration, and ultra filtration.

Winesecrets provides services from Napa, Sebastopol, and Paso Robles, CA; Dundee, OR; Richmond, WA; Penticton, B.C. Canada, and Niagara on the Lake, Ontario, Canada.

For more information, contact:
Winesecrets
tel: 707/824-2022 or toll-free: 888/656-5553
e-mail: domingo@winesecrets.com
website: www.winesecrets.com

PLEASE SEE WINESECRETS AD, PAGE 50.

SILICON VALLEY BANK

Silicon Valley Bank's Wine Division is a leading provider of financial services to wineries and vineyards in the western U.S., with over 300 winery and vineyard clients, and growing, in Napa Valley, Sonoma County, the Central Coast of California, Oregon, and Washington.

Silicon Valley Bank's premium wine specialists are a unique group — they are experts in the wine industry and understand that the winemaking business is like few others. They have a thorough appreciation for the rewards that come from winemaking, but also understand the risks and challenges faced by vintners. You'll find the Wine Division team of 30 professionals is enthusiastic about helping you turn challenges into opportunities.

Silicon Valley Bank ›
A Member of SVB Financial Group

The Wine Division is part of Silicon Valley Bank, a member of SVB Financial Group, a $5.4 billion financial holding company providing a full range of diversified financial services to emerging growth and mature companies in the technology, life science, private equity, and premium wine industries.

The Wine Division's goal is to provide clients with custom financial solutions, from deposits, foreign exchange, cash management, and finance, to help them stay focused on growing grapes and making wine — from vintage to vintage.

For more information, contact:
Silicon Valley Bank
Wine Division
William A. Stevens, Division Manager
899 Adams St, Ste G-2, St. Helena, CA 94574
tel: 707/967-1373; fax: 707/967-4827
e-mail: wstevens@svb.com
website: www.svb.com

CASTORO BOTTLING COMPANY

Since 1989, Castoro Bottling has served wineries throughout California with a fleet of high-tech mobile bottling lines. The demand for Castoro Bottling's timely, professional, and knowledgeable service has triggered the bottling of over 60 million bottles of wine with natural cork, synthetic closures, or screwcaps.

Castoro Bottling offers four technologically-advanced mobile bottling lines that arrive on your schedule to serve all your bottling needs. Castoro Bottling can bottle up to 2,500 cases per day, serving any size winery. Custom services include labeling and packaging consultation. Recognizing the need for wineries to offer alternative closures, Castoro Bottling has outfitted two bottling lines with **screwcap** capabilities.

CASTORO BOTTLING Co.
CBC
FILLING YOUR NEEDS

"Our investment in the best equipment and the best people to run that equipment is what sets Castoro Bottling apart," says Niels Udsen. "We anticipate the needs of a winery better than any other bottler simply because I have owned and operated a successful winery for nearly 25 years. Castoro Bottling is a partner who knows and understands your business."

Since 2005, Castoro Bottling Company has offered Velcorin dosing. Please call, or visit www.castorobottling.com for more information.

For more information, contact:
Castoro Bottling Company
Niels Udsen
PO Box 954, Templeton, CA 93465
tel: 805/467-2002; fax: 805/467-2004
e-mail: Niels@castorobottling.com
website: www.castorobottling.com

PLEASE SEE CASTORO BOTTLING AD, PAGE 28.

WINE MANAGEMENT SYSTEMS

Wine Management Systems (WMS) is a technology leader offering an affordable software solution to wineries. Module 1 tracks vineyard and grower operations, production and bottling, and inventory and allocation management. Module 2 streamlines point-of-sale and wine club operations, and synchronizes all financial information to QuickBooks or Microsoft AX, depending on winery size.

WMS
WINE MANAGEMENT SYSTEMS

WMS web-hosted Software as a Service (SaaS) offers:

- **Compliance** — Avoids fines, facility shutdowns, or both using transaction-based reporting tools. Creates compliance certificates for the TTB and FDA Bioterrorism Act of 2002.
- **Strategic** — WMS SaaS model minimizes investment risk and creates cash-flow efficiencies with a reasonable monthly subscription rate. Limited, introductory rate is $300 to $650/module per month, with perpetual licenses available. Pricing is dependent on case production, wine-club members, and number of users.
- **Convenience** — Users have access to their winery data anywhere in the world they have Internet connectivity. No hardware compatibility issues exist since only a web-browser is required.
- **Adaptable** — SaaS software can be deployed in 30 days, and future upgrades are introduced at each log-on, negating annual maintenance fees and compatibility issues. Perpetual licenses have a below-industry-standard 15% annual maintenance fee.

Please visit the website or contact WMS to schedule a 20-minute demonstration.

For more information, contact:
Wine Management Systems
141 Irwin St., San Rafael, CA 94901
tel: 415/246-7792; fax: 415/453-4749
e-mail: pat@WineManagementSystems.com
website: www.WineManagementSystems.com

SUNLIGHT ELECTRIC

Few solar integrators can match Sunlight Electric's winery solar experience and expertise. Sunlight focuses exclusively on commercial solar, and has an unmatched understanding of the wine industry. Sunlight Electric brings purpose-driven innovation, deep technical expertise, broad financial acumen and resources, and industry-leading professionalism and responsiveness to the winery community, helping winery owners and managers find the ideal solar solution.

sunlightelectric

Sunlight Electric customers include: Frog's Leap Winery, Honig Winery, Long Meadow Ranch, Robert Keenan Winery, Boeschen Vineyards, Staglin Family Winery, Havens Wine Cellars, Saintsbury, Cuvaison, Trefethen Family Vineyards, ZD Wines, Silver Oak Cellars, Miner Family Winery, Patz & Hall, Lancaster Estate, and many more.

Whether you're looking at solar for the first time, or have explored it in the past unsuccessfully, Sunlight Electric is making solar power feasible, affordable, and simple.

For more information, contact:
Sunlight Electric
444 Eighth St., San Francisco, CA 94103
tel: 415/655-4540
e-mail: info@sunlightelectric.com
website: www.sunlightelectric.com

AXIOM ENGINEERS, INC.

Successful winery projects by Axiom Engineers, ranging from 2,000-case boutique wineries to 30,000-ton custom crush facilities, include:

- Gentle fruit handling systems;
- Fermentation and barrel storage;
- Wastewater permitting and design;
- Water systems permitting and design;
- Process piping systems;
- Refrigeration;
- Control system integration;
- Cogeneration and solar energy;
- Receiving and crush pads;
- Catwalk systems;
- HVAC and plumbing;
- Hospitality;
- Cave ventilation and radiant cooling;
- Fire protection and smoke control;
- LEED™ and green building.

AXIOM ENGINEERS℠

Axiom Engineers℠ truly understands that one size or style does not fit all. Axiom's Engineers use their knowledge and experience to work with the winery team to determine what is right for wine style and the winery's business model.

For more information, contact:

Axiom Engineers, Inc.
Raymond Cole, President
Tim Ryan, VP Industrial Systems
Troy Davis, Project Manager
1712 Jefferson St., Napa, CA 94559
tel: 707/251-1468 (Napa)
tel: 831/649-8000 (Monterey)
e-mail: rayc@axiomengineers.com
website: www.axiomengineers.com

PLEASE SEE AXIOM ENGINEERS AD, PAGE 12.

GOVERNMENT LIAISON SERVICES, INC.

Government Liaison Services (GLS) was founded in Washington, D.C. (1957) to provide businesses with access to Federal Government offices and the vast amount of information available there.

Today, GLS has a large staff of experts trained in various areas, including intellectual property research, and food and beverage labeling and compliance. All associates are college graduates whose average experience exceeds 20 years.

For 50 years, GLS has obtained TTB (formerly BATF) label approvals along with pursuing rulings on formula submissions, lab analysis results, advertising, and many other TTB matters for thousands of clients, including wineries, law firms, sole practitioners, Fortune 500 companies, and smaller-size businesses throughout the U.S. and the world.

GLS specializes in performing trademark, patent, and copyright search services and is the only major trademark search firm that routinely searches both a computerized database of Federal trademark records, and records from the U.S. Patent and Trademark Office's library, including all "24-hour box" records.

The GLS standard turnaround time for trademark searches is 48 hours. The firm's location in Arlington, VA allows first-hand consultation and guidance from U.S. Patent and Trademark Office officials.

For more information, contact:

Government Liaison Services, Inc.
200 N. Glebe Rd. #321, Arlington, VA 22203
tel: 800/642-6564,
or 703/524-8200 outside U.S.
fax: 703/525-8451
website: www.trademarkinfo.com

PLEASE SEE GOVERNMENT LIAISON SERVICES AD, PAGE 77.

ELYPSIS, INC.

Elypsis® Winery Solutions provides a complete software package exclusively for the wine industry, which allows wineries to automate, "everything after the wine hits the bottle." Combining tasting room, wine club, and web sales with wholesale, allocations, depletions, and distribution, winery personnel gain immediate insight into winery performance and financial health.

Elypsis Inc. ®

Elypsis Winery™ runs on the Microsoft Dynamics NAV® platform to offer wineries the ability to operate from a single database, eliminating software incompatibility and headaches. **Elypsis Winery** organizes all aspects of winery operations including GL, AP/AR, payroll, order management, remote order entry, allocations, depletions, trade account management, and contact management.

Elypsis Retail WineClub Manager™ is fully integrated into Microsoft Dynamics Retail Management System® POS. It tracks, maintains, processes, and effortlessly ships an unlimited number of wine club orders. Features include: a single database for order history, seamless credit card processing; unlimited sales tax updating, and efficient mail merge features for order fulfillment.

Elypsis, a Microsoft Gold Certified Partner, has been providing software products and consulting services to Napa Valley businesses since 1987. Elypsis references and case studies tell the story of a leader in total software solutions for wineries.

For more information, contact:

Elypsis, Inc.
1957 Sierra Ave., Napa, CA 94558
tel: 707-257-8912
web: www.elypsis.com

PLEASE SEE ELYPSIS AD, PAGE 48.

Cork Quality Council

The Cork Quality Council (CQC) is a nonprofit organization established to promote and improve quality assurance procedures for the wine and cork industries. The eight current members are: Amorim Cork America, Cork Supply USA, Ganau America, Juvenal Direct, Lafitte Cork & Capsule, M.A. Silva Corks USA, Portocork America, and Scott Laboratories.

All CQC members adhere to stringent standards dedicated to improving quality. These standards have helped CQC members to significantly reduce the incidence of cork taint in their inventories. The CQC conducts annual audits to verify that all approved quality control protocols are observed.

CORK
QUALITY
COUNCIL

The foremost quality control measure is based on a chemical screening method for TCA, developed by ETS Laboratories under CQC sponsorship. This analytical method is now widely used throughout the U.S., Europe, and Australia by wineries and cork suppliers. Other audited CQC procedures include moisture levels, physical integrity, residual oxidants, and the maintenance of documentation.

For more information, contact:
Cork Quality Council
11160 Terrace Dr., Forestville, CA 95436
tel: 707/887-0141
e-mail: info@corkqc.com
website: www.corkqc.com

PLEASE SEE CORK QUALITY COUNCIL AD, PAGE 34.

Hinman & Carmichael LLP

The law firm of Hinman & Carmichael LLP, established in 1991, practices exclusively in the field of alcoholic beverage law and represents wine, beer and spirits industry members at all levels, from producer and importer to retailer to marketing agent website operators. The firm is the leading U.S. law firm for internet alcohol marketing compliance, both direct and through the three-tier system.

HINMAN &
CARMICHAEL
LLP

The firm counsels clients on a vast array of alcohol beverage regulatory issues, and is experienced in all facets of U.S. alcohol beverage law including: licensing; ABC and TTB hearing and accusation proceedings and regulatory defense; business transactions (distribution agreements and distributor relations, marketing agreements, grape purchase and sale agreements, purchase contracts, royalty agreements, corporate formation and documents, etc); trade practices, and trade practice training; rebates and promotions; and trademark registration.

The firm is politically active, is involved with and supports a great variety of wine and other industry organizations, including Wine Institute, Wine America, Family Winemakers of California, Specialty Wine Retailers Association, California Retailers Association, California Restaurant Association, Golden Gate Restaurant Association, Women for Winesense, Sonoma County Vintners, Hospices of Sonoma, ZAP, Rhone Rangers, Lodi Winegrape Commission, and California Association of Winegrape Growers.

Please visit the firm's website: www.beveragelaw.com.

For more information, please contact:
Hinman & Carmichael LLP
260 California St. #1001
San Francisco, CA 94111
tel: 415/362-1215; fax: 415/362-1494
website: www.beveragelaw.com

The Vinotec Group

Lisa Van de Water, who founded The Wine Lab in 1975 (but is no longer involved) has advised wineries for many years. Since 2003, she has operated Vinotec Napa, and collaborates with consultants internationally in The Vinotec Group, promoting information exchange and technology transfer to raise wine quality.

Lisa looks at wine as a whole, not just as a series of numbers, interpreting what lab results mean, diagnosing and solving winemaking problems, and making practical suggestions to improve vineyard or winery procedures.

At Vinotec Napa, management of wine microbes — good and bad — is a prime concern, including avoiding stuck ferments, *Brettanomyces*, *Lactobacillus*, *Pediococcus*, and other undesirables. Combining traditional and PCR-based genetic methods gives the most useful and cost-effective results for microbiological testing and identification.

Seminars and workshops on fermentation and wine microbiology, and in-house training sessions on microbe identification, are held for wineries in several countries.

The Vinotec Group also formulates a range of fermentation nutrients. Free technical support is provided for Superfood® (from American Tartaric Products and Beverage Supply Group) and other nutrients including Leucofood, Vitamix, and Supervit (bsgwine.com, 800/585-5562).

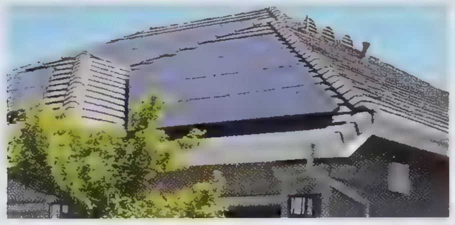
For more information, contact:
The Vinotec Group
Lisa Van de Water
607 Cabot Way, Napa, CA 94559
technical: 707/953-7072
fax: 707/224-4028
e-mail: badwinelady@aol.com
website: www.vinotecnapa.com
International Afflilates:
Chile: www.vinotec.com (en español)
New Zealand: info@pros.co.nz
South Africa: www.vinlab.com

PREMIER POWER RENEWABLE ENERGY, INC.

The dedicated Premier Power team is passionate about the environment, and works to integrate solar systems into the environment without compromising the architecture of the facility or disrupting the surrounding landscape — there is a better way to enjoy life, both environmentally and financially.

Premier Power specializes in both business and residence installations. Utilizing a turn-key approach, quality workmanship, and high professional standards, every project is unique and every solar system is designed to meet specific needs, combining form and function with design and vision – Solar with Style.

With the exceptional "Zero Defect" quality assurance program, a dedicated team of talented project managers, electricians, and engineers strive to make customer satisfaction the top priority; 98% of their customers answered YES when asked if they would recommend Premier Power to their friends and relatives.



When it came to solar, these fine wineries and vineyards chose Premier Power: Chappellet Winery, Trinchero Family Estate, Shafer Vineyards, Chateau Montelena, Spottswoode Estate Vineyard & Winery, Silverado Vineyards, Larkmead Vineyards, Madrona Vineyards, Terre Rouge Wines, and L'Aventure.

For more information, contact:

Premier Power Renewable Energy, Inc.
4961 Windplay Dr., #100
El Dorado Hills, CA 95762
tel: 877/939-0400
e-mail: info@premierpower.com
website: www.premierpower.com

PLEASE SEE PREMIER POWER AD, PAGE 30.

HALL & BARTLEY

Hall & Bartley is a full-service architectural firm specializing in the design and master planning of wineries. Pictured is a preliminary image of Sierra de Montserrat Winery in Loomis, CA.

Hall & Bartley's unique talents go beyond traditional architecture in their ability to understand and analyze the functional requirements of a modern winemaking facility. Through careful consideration and attention to client's desires, Hall & Bartley remains a leading winery architect in the U.S.

With 25 years' experience, Hall & Bartley are responsible for the design and planning of many California premier wineries including: Flowers Winery, Marimar Torres Estate, Geyser Peak Winery, Chateau St. Jean, Kendall-Jackson's La Crema facility, Atlas Peak Vineyards, Meridian Vineyards, and St. Francis Winery.

Current projects include Sbragia Winery, Sierra de Montserrat Winery, expansion projects for J Vineyards & Winery, Quivira Winery, Skinner Winery, Merriam Vineyards, and an expansion for Bennett Lane Winery.

Hall & Bartley's services include feasibility studies, master planning, process sizing and flow analysis, architectural design, construction document preparation, government permitting assistance, and construction administration for both new and existing winery projects.

For more information, contact:

Hall & Bartley
4701 Old Redwood Hwy, Ste 2B
Santa Rosa, CA 95403
tel: 707/544-1642; fax: 707/544-1646
e-mail: scott@hallandbartley.com

PLEASE SEE HALL & BARTLEY AD, PAGE 79.

WALLACE GROUP

Wallace Group has built its reputation in part on delivering thoughtful, inventive planning and engineering solutions to wineries. A multi-disciplined approach — combining planning, survey, engineering, design, and construction management — allows Wallace Group to work from conceptual design through construction to provide the essential elements needed in every commercial development.

Wallace Group thrives on working with environmentally-sensitive land to create low-impact, sustainable designs and solutions. The most effective and innovative technologies are utilized to manage process wastewater, an abundant by-product of any successful winery. The use of sustainable, natural treatment systems — Swanson Advanced Integrated Pond Systems (AIPS) and constructed wetlands — paired with traditional mechanical components allow for efficient treatment and reuse or disposal of process wastewater while adhering to Regional Water Quality Control Board regulations.

WALLACE GROUP®

With services ranging from innovative planning and engineering, to creative landscape design and construction management, Wallace Group can assist in designing new wineries, or improving the operation and design of existing facilities. Wallace Group has the resources and the experience to manage winery projects from start to finish.

For more information, contact:

Wallace Group
612 Clarion Ct., San Luis Obispo, CA 93401
tel: 805/544-4011; fax: 805/544-4294
e-mail: info@wallacegroup.us
website: www.wallacegroup.us

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P. Iland, N. Bruer, A. Ewart, A. Markides & J. Sitters
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Diseases and Pests
Nicholas, Margarey, Watchel
Dept. of Primary Industries & Resources, South Australia **106pp—$40**

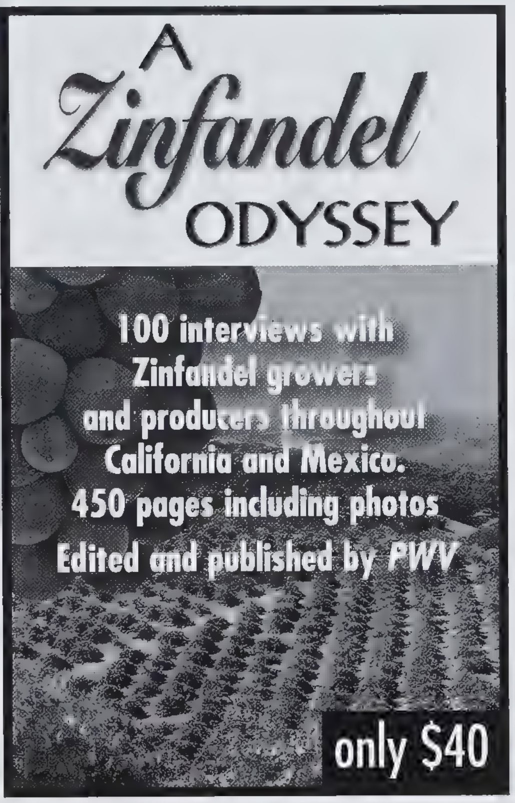
Diseases, Pests, & Grape Disorders Field Guide
Magarey, MacGregor, Wachtel, & Kelly
Sturdy, laminated, pocket-sized guide containing more than 350 color photos with short, easily-read descriptions of most diseases, pests, and disorders found in vineyards. **107pp—$30**

Flowering and Fruitset in Grapevines
Peter May
How weather affects fruitset. Published by Phylloxera and Grape Industry Board of South Australia. **120pp—$30**

Growing Quality Grapes to Winery Specifications by M. Kristic, G. Moulds, B. Panagiotopoulos, & S. West
Quality measurement and management options for grapegrowers. **103pp—$35**

Illustrated Guide to Microbes and Sediments in Wine, Beer and Juice
Dr. Charles G. Edwards
125 color photographs showing over 30 different species of yeast, bacteria and mold commonly found in wines, as well as frequently encountered sediments.
126pp—$125

Micro Vinification
M.R. Dharmadhikari & K.L. Wilker
A practical guide for home winemakers, commercial small-scale producers, and large wineries making small, experimental lots of table wine. **120pp—$30**


A Zinfandel ODYSSEY

100 interviews with Zinfandel growers and producers throughout California and Mexico.
450 pages including photos
Edited and published by PWV

only $40

Precision Viticulture
T. Proffitt, R. Bramley, D. Lamb, E. Winter
A range of tools and technologies for vineyard management with practical applications and commercial case studies. **90pp—$44**

Soil, Irrigation & Nutrition
P. Nicholas
Describe vineyard soil types, how to manage soil treatments, cover crops, and herbicides, optimize water quality, irrigation systems. Nutrient deficiencies and toxicities, how to manage nutritional requirements.
201pp—$55

Sunlight into Wine
R. Smart & M. Robinson
Canopy management and economics, improvement of canopy microclimates, importance of winegrape canopies, construction of trellis systems. **88pp—$40**

Taming the SCREW: A manual for winemaking with screwcaps Tyson Stelzer
Detailed technical discussion of screwcaps and the bottle, reasons for choosing screwcaps, winemaking procedures, chemistry, bottling, capping, handling, storage, and ageing. **305pp—$90**

Vineyard Simple Tom Powers
Provides a clear outline with diagrams and color photos on how to build and maintain your own vineyard. **118pp—$20**

Viticulture, Vol. I, Resources in Australia, (2nd Edition)
B.G. Coombe & P.R. Dry
With worldwide application. Soils, climates, grapevine classifications, grape varieties, phenology, rootstocks, planting material, vineyard site selection, and grape berry development.
211pp—$60

Viticulture, Vol. II, Practices in Australia,
B.G. Coombe & P.R. Dry
Grapevine propagation, vineyard establishment, pruning, canopy management, irrigation, grapevine nutrition, grape pests, disease, and protection. **384pp—$60**

Viticulture & Environment
John Gladstones
Site, variety, and cultural practices. Climatic analysis of Australian and world viticultural areas, new viticultural sites and possible changes in the climatic conditions.
310pp—$45

Winegrape Berry Sensory Assessment in Australia
E. Winter, J. Whiting, J. Rousseau
How to examine berries before harvest with 20 standardized and industry-tested criteria, by judging stems, skins, pulp, and seeds.
64pp—$30

Wine Marketing & Sales: Success Strategies for a Saturated Market
L. Thach, J. Olsen, & Paul Wagner
Comprehensive text provides in-depth, hands-on approach to wine marketing and sales. **323pp—$70**

Winery Planning & Design CD, Edition 14
Bruce Zoecklein
Expanded edition is unique book on CD outlining winery planning and design: including many winery blueprints, "green building," sustainable planning, and business planning.
Over 1,500pp outline—$110

ETS LABORATORIES

ETS Laboratories is one of the most advanced analytical wine laboratories in the world. With four locations throughout the west coast, ETS offers wineries and suppliers access to the most modern and technically demanding analytical methods available in the wine industry. ETS was the first independent wine laboratory accredited by the American Association for Laboratory Accreditation to ISO 17025 quality standards.

ETS provides a range of analytical services for grape and wine development through harvest, winemaking, aging, and bottling quality control. ETS continues to introduce new analytical programs for wine and juice spoilage organisms based on real time Scorpion™ genetic detection. ETS is the sole U.S. licensee of this molecular technology with applications for the wine industry.

ETS continues to meet and exceed the wine industry's analytical needs by providing the highest standards of analytical data, quality assurance, customer service, and client confidentiality. ETS offers courier "pick–up" services in Napa and Sonoma counties, and a convenient night drop box for after-hours samples. Most test results are available within 24 hours.

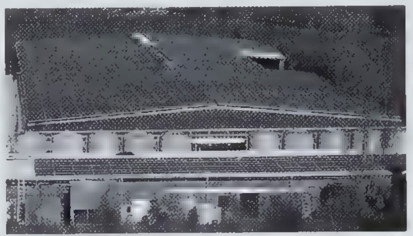
For more information, contact:

ETS Laboratories (CA)
899 Adams St. #A, St. Helena, CA 94574
tel: 707/963-4806; fax: 707/963-1054
ETS Laboratories (Central Coast)
1972 Hobson Ave., Greenfield, CA 93927
tel: 831/385-3437; fax: 831/385-5187
ETS Laboratories (OR)
1819 NE Baker St., McMinnville, OR 97128
tel: 503/472-5149; fax: 503/217-0668
ETS Laboratories (WA)
3020 Isaacs Ave., Walla Walla, WA 99362
tel: 509/524-5182; fax: 509/526-8053
e-mail: info@etslabs.com
website: www.etslabs.com

PLEASE SEE ETS LABORATORIES' AD, PAGE 43.

SOLARCRAFT

Solarcraft is one of the most experienced solar energy contractors in Northern California. SolarCraft earned its reputation as "Solar Energy Experts" by providing excellent solar electric and solar thermal systems for residences, businesses, and government projects since 1984.



SolarCraft's recent projects include: Jacuzzi Vineyards (Sonoma); Cline Cellars (Sonoma); Merryvale Vineyards (Starmont [Napa]); Wellington Vineyards (Glen Ellen); Fountaingrove Golf & Athletic Club (Santa Rosa); Marin Builder's Association (San Rafael); Geyserville Fire Station; and Woodlands Market (Kentfield).

For more than 23 years, this certified "Green Business" has been providing solar thermal and solar electric consulting, design, sales, installation, and maintenance services.

SolarCraft has installed nearly 4,300 solar energy systems in Northern California, totaling over 1.5 million square feet of solar collector surface. Every year, SolarCraft-installed systems save customers over $8 million in energy costs and eliminate more than 28,000 tons of greenhouse gases.

SolarCraft's knowledgeable and experienced representatives are available to provide a complete assessment of your energy requirements, and can provide a complete solution to meet your needs. A FREE solar analysis includes PV design and wattage recommendations that are tailored to your requirements. All the paperwork is handled to maximize current rebates and tax incentives, and a variety of financing packages are offered.

For more information, contact:

SolarCraft
285-D Bel Marin Keys Blvd.
Novato, CA 94949
tel: 415/382-7717, ext. 26; fax: 415/382-0592
e-mail kburnett@solarcraft.com
website: www.solarcraft.com

PLEASE SEE SOLARCRAFT AD, PAGE 8.

COMPLIANCE SERVICE OF AMERICA

Compliance Service of America (CSA) offers expert and effective compliance services for wineries, vineyard owners, and negociants. CSA specializes in crafting compliance solutions for winery business plans.

CSA has helped hundreds of successful vintners and wine companies to:

- Start a new winery or enter into the wine business;
- Buy a winery or a brand, expand a wine business, add a new tasting room or a warehouse;
- Obtain a DSP to lower wine alcohol content and retain estate bottling claims/report the necessary distilled spirits operations;
- Set up alternating premises;
- Change the ownership of a winery, estate planning or succession. CSA can help with reporting and recommend the best way to craft the new ownership to avoid compliance issues.

CSA

For more than 20 years, CSA has provided compliance solutions for all segments of the wine industry nationwide.

The CSA website provides a FREE library of compliance wisdom and articles at www.CSA-compliance.com. From alternating proprietorships to labeling and wine bonds, these articles provide a wealth of information and are useful for everyone in the industry.

For more information, contact:

Compliance Service of America
Alex Heckathorn, Jay McPherson,
Dyana Nedra, Sara Schorske
54476 Mariah Rd., Myrtle Point, OR 97458
tel: 800/400-1353; fax: 541/396-6888
e-mail: csa@csa-compliance.com
website: www.csa-compliance.com

PLEASE SEE CSA AD, PAGE 52.

SPURGEON PAINTING, INC.

Founded by Bob Spurgeon in 1976, Spurgeon Painting has provided award-winning painting services to wineries, commercial property owners, and homeowners throughout Napa Valley and Sonoma County for nearly three decades. Courteous, well-trained staff is one key reason why winery customers recommend and request Spurgeon Painting's services. Spurgeon Painting is dedicated to timely completion, attention to detail, safe and clean job sites, and unparalleled customer satisfaction.

Spurgeon Painting understands the specialized requirements of the wine industry. Skilled, professional crews are trained in the use of epoxy and urethane coatings for steel and concrete as well as conventional paints and stains. The finest biodegradable, non-chlorinated cleaners are always used to preserve your delicate winemaking environment.

Spurgeon Painting is committed to completing your painting project on time, on budget, and to your exact specifications, and to doing it all with sparkling and efficient customer service.

Let Spurgeon Painting show you the quality that earned the 1993 Painting and Decorating Contractors of America National Award for Excellence in Painting. Visit their website, www.spurgeonpainting.com, to view the spectacular work done for some outstanding vintners in wine country. Then, call for a quote on your next winery-painting project.

For more information contact:

Spurgeon Painting, Inc.
1308 Dynamic St. #8, Petaluma, CA 94954
tel: 707/763-7185; fax: 707/763-5659
e-mail: karen@spurgeonpainting.com
website: spurgeonpainting.com

G3 ENTERPRISES

G3 Lab Services specializes in wine quality and packaging integrity testing. Other services include TCA remediation, oxygen measurement, and process modeling.

G3's state-of-the-art mobile bottling line serves all of California, with the capability of filling up to 4,000 cases per day. G3 mobile bottling's additional services include documented sanitation levels, in-line case printing of production information, liquid nitrogen dosing, under-cap nitrogen flushing, and automatic case sealing with hot melt glue, among others.

In 2008, G3 Logistics marks its 25th anniversary of providing transportation and warehousing services worldwide. G3 operates more than 1,000 grape trailers, making it the largest fleet of trailers in the industry. The specialized lightweight chassis allows 6,000 additional pounds (180 cases of wine) into a 40-foot shipping container, resulting in a 15% cost savings for customers. G3 Logistics also offers more than five million square feet of food-grade, bonded warehouse space throughout the U.S. In California's Central Valley, three million square feet of warehouse operates 24 hours per day, seven days per week, allowing G3 to deliver product to its customers when they need it.

For more information, contact:

G3 Enterprises
Kimberly Jussely, Marketing Specialist
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tel: 209/341-6658
e-mail: g3logisticscustomer.service@g3enterprises.com
website: www.g3enterprises.com

EXCHANGE BANK

Exchange Bank's commercial banking team of experienced lenders, understand the unique needs of the wine business. From growing young vines to producing fine wines, they finance it all. The bank's internal lending capacity and experienced staff enable it to meet the growing credit needs of wineries and growers throughout the North Coast.

The commercial banking team works with each individual client to determine which products and services will work best for their unique situation. The commercial banking team often partners with Dumac Leasing, a division of Exchange Bank, which offers equipment financing for wineries and other businesses.

Recognized as the "Best Business Bank," and "Best Company to Do Business With in the North Bay," Exchange Bank lives up to high standards of customer service.

As a lender, Exchange Bank offers fast, local decisions, flexible terms, and 118 years of experience.

For more information, contact:

Exchange Bank
Member FDIC
Steve Herron, SVP Commercial Banking Manager
tel: 707/524-3102
web: www.exchangebank.com

PLEASE SEE EXCHANGE BANK AD, PAGE 30.

LESCURE ENGINEERS, INC.

Is Zero Carbon Energy an achievable goal for a large winery operation? Lescure Engineers, along with the other members of The DesignSmart Group, is in the process of transforming these ambitious goals into reality for a large Sonoma County winery. The project will develop and implement a site-specific, integrated energy efficiency program, including refrigeration, hot water, green building improvements, solar thermal, and solar photovoltaics.

Lescure Engineers has successfully secured a use permit to double wine production to three million cases per year at the same Sonoma County facility without expanding the winery process wastewater system. Engineers are now working on a zero water discharge strategy to eliminate the wastewater pond entirely.

LESCURE
ENGINEERS, INC

Lescure Engineers has a reputation for innovation dating back to 1979. The new Environmental Resources Engineering staff start with an Investment Grade Energy Audit, designed to help decision-makers determine life-cycle costs and savings.

Lescure can assist with various types of public and private financing available for energy and water efficiency upgrades. Lescure services extend through engineering and permitting, construction administration and observation, commissioning, training and operations support.

Visit the website to learn more about Lescure Engineers, Inc. and The DesignSmart Group.

For more information, contact:
Lescure Engineers, Inc.
4635 Old Redwood Hwy
Santa Rosa, CA 95403
tel: 707/575-3427; fax: 707/542-2353
e-mail: le@lescure-engineers.com
website: www.lescure-engineers.com

PLEASE SEE LESCURE ENGINEERS AD, PAGE 46.

TURRENTINE BROKERAGE

Turrentine Brokerage knows the wine business inside and out. For wine and grape supplies, and to buy or sell grapes or wines in bulk, including international wines, call Turrentine Brokerage.

TURRENTINE
GRAPES & WINE

Call Turrentine Brokerage for win/win negotiations, personal service, and a comprehensive selection of premium wines and grapes. A UC Davis-educated winemaker and a Fresno State-educated viticulturist are on staff. Ask about the *Turrentine Collateral Value Report*, inventory appraisal service, the oft-quoted *Market Update* newsletter for in-depth analysis of the grape and wine markets, and the *Turrentine Outlook*, which provides information available about long-term industry trends.

Turrentine has a record of predicting wine business trends, and helping clients profit from them. Turrentine knows the sources of supply, history and capabilities, the brands, people, and finances. Turrentine earns trust and guards confidences carefully; makes deals happen; bring businesses together efficiently, creatively, and quickly. Turrentine understands the key factors that make your business tick, and how to avoid many hidden disasters.

For more information, contact:
Turrentine Brokerage
Steve Fredricks, Vice President/
Managing Partner
Michael Robichaud, Broker/Partner
Brian Clements, Senior Partner
Larry Kavanagh, Broker
Erica Moyer, Broker
Bill Turrentine, President/Partner
Matt Turrentine, Broker
Steve Robertson, Broker
Stephens Moody, Broker
7599 Redwood Blvd. #103, Novato, CA 94945
tel: 415/209-9463; fax: 415/209-0079
e-mail: info@turrentinebrokerage.com
website: www.turrentinebrokerage.com

PLEASE SEE TURRENTINE BROKERAGE AD, PAGE 21.

HANSEL LEASING, INC.

For more than 45 years, Hansel Leasing has been a premier source for leasing. Hansel Leasing continues as a full-service leasing company; providing leases for new and used vehicles and equipment. Every lease is customized to suit the specific needs of each client.

Hansel Leasing knows the wine business. Stephen E. Hansel, president of Hansel Leasing, is owner/-winemaker of Walter Hansel Winery (Santa Rosa, CA). His hands-on experience and knowledge have been instrumental in making the company a leading leasing resource for the wine industry.

HANSEL
LEASING

We Lease Everything!

As a direct lender, Hansel Leasing's professionals are able to make credit decisions, create documents, and pay vendors in a timely manner. The staff's goal is to make every transaction simple and convenient for clients and their suppliers.

Hansel Leasing can provide lease-financing for your winery that includes: crushers, presses, bottling lines, stainless steel tanks, oak wine barrels, refrigeration systems, barrel racks, vineyard wind machines, sorting tables, forklifts, tractors, seeders, or sprayers.

Want to lease something not on the list? Call Hansel Leasing — they lease everything.

For more information, contact:
Hansel Leasing, Inc.
Jim Taylor, Lease Manager
PO Box 3437, Santa Rosa, CA 95402
tel: 707/544-2822; fax: 707/578-8306

LAURENCE FERAR & ASSOCIATES, INC

Established in 1983, Laurence Ferar & Associates is committed to quality architectural and landscape design with a common sense approach to meeting client needs. To research winery design, Larry Ferar has visited hundreds of facilities in the U.S., France, Spain, Italy, and New Zealand, talking with winemakers about specific challenges and unique solutions.

Like winemaking, winery design is a careful blend of art, science, and economics. Similar to the concept of *terroir,* the unique sense of place inherent to each site is central to the firm's approach.

As a LEED™ accredited professional, Ferar is committed to principles of sustainable development and energy-efficient design.

The firm has broad experience in gravity-flow facilities including: Adelsheim Vineyards (OR), Lemelson Vineyards (OR), Pepper Bridge Winery (WA), and Woollaston Estates (Nelson, New Zealand). Other clients include: Leonetti Cellars (WA), Alloro Winery (OR), Red Mountain Vineyards (WA). Currently in design are projects for Kistler Vineyards and Littorai Wines in Sonoma (CA), Benjamin Bridge and Sandhill wineries in Canada, and Firesteed Cellars and Revana Vineyard in Oregon.

Professional services include site and existing building evaluations, master planning, integrated building and garden design, and permitting assistance. The firm prides itself on site-specific solutions for both large and small projects.

For more information contact:
Laurence Ferar & Associates, Inc.
Larry Ferar
1016 SW Clay St., Portland, OR 97201
tel: 503/241-5447; fax: 503/241-0826
website: www.ferar.net

VINQUIRY, INC.

Vinquiry provides analytical services, winemaking products, sensory services, and enological consulting to the wine industry. Each California location — in Sonoma County, Napa, Santa Maria, and Paso Robles — offers personalized and expert service for every customer.

A new Wine Improvement Panel helps winemakers enhance the quality of their wines by combining sensory consulting with a multitude of wine treatment options, to fix noticeable defects or improve a finished wine. Vinquiry consultants will perform a sensory evaluation, set-up a trial with common wine additives or products, and report the results back to a client with recommendations.

Vinquiry's new sanitation services will help prevent wine contamination and spoilage. The Cellar or Bottling Sanitation Audit is a quick, on-site audit of current sanitation practices and includes a written report with observations, results, and basic recommendations.

A Quality Assurance Assessment includes a full-day, on-site assessment of the facility that is tailored to winery needs. A report with observations and recommendations for improvements will be provided.

Vinquiry's sensory services include standard sensory evaluation, staff sensory training, descriptive analysis, cork aroma evaluation, discrimination testing, and TCA threshold testing.

Along with the newer tests and sensory services, Vinquiry continues to offer basic wine analysis to assist winemakers. Vinquiry has increased the number of in-house consultants available for large consulting projects, and quick conferences to resolve winemaking issues.

For more information, contact:
Vinquiry, Inc.
7795 Bell Rd., Windsor, CA 95492
tel: 707/838-6312; fax: 707/838-1765
e-mail: info@vinquiry.com
website: www.vinquiry.com

RENEWABLE TECHNOLOGIES, INC.

Renewable Technologies, Inc. (RTI) has been an industry leader, providing solar electric solutions for vineyards and wineries looking to manage their cash flow and add a sustainable aspect to their vision of business. RTI can provide the details specific to each renewable energy project, including rebates, tax incentives, funding, and construction costs.

The RTI in-house engineering team provides unique solutions for each client's needs, including roof-mounted, rack-mounted in vineyards, or custom solar support structures that provide shaded parking.

RENEWABLE TECHNOLOGIES INCORPORATED
-THE FUTURE OF ENERGY-

Darryl Conklin, president of RTI, notes that wine industry leaders embrace sustainable farming and business practices that showcase to others the true nature of corporate responsibility. They also recognize the economic and public relations value of adding a Solarstar™ Electrical Energy System to their facility.

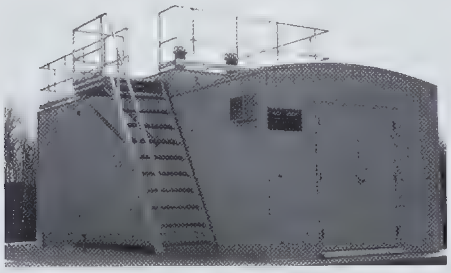
John and Craig Ledbetter (Vino Farms, Lodi, CA) were extremely satisfied with their recently installed 30 kilowatt SolarStar™, which supplies power to irrigation pumps for their vineyard. They selected RTI because of their trust in RTI's expertise, quality of workmanship, and intrinsic desire to provide an effective and sustainable solution to satisfy electrical energy requirements.

RTI provides turnkey vineyard and winery solar photovoltaic installations. Please call to discuss *your* vision, and to schedule a site survey and economic analysis.

For more information, contact:
Renewable Technologies, Inc.
PO Box 1569, 11851 Fibreform Rd.
Sutter Creek, CA 95685
tel: 209/223-3002
e-mail: sales@renewable.com

ADI SYSTEMS INC.

ADI Systems Inc. specializes in industrial wastewater treatment and offers many solutions for wineries, from treatment to water reuse. ADI has installed hundreds of systems worldwide, including nearly 20 wineries and over 50 breweries, distilleries, and alcoholic beverage production facilities, for clients like Anheuser-Busch, Coors Brewing, Guinness, and Baileys.



ADI-MBR (Membrane Bioreactor) — A membrane bioreactor (MBR) system, based on the world's leading MBR technology, can produce reuse-quality water within an easy-to-operate, small-footprint package. Effluent from the ADI-MBR will meet the strictest discharge requirements, to give a winery a variety of disposal options, including irrigation, aquifer recharge, or direct discharge. The technology has been used in 20 wineries worldwide.

Anaerobic Technologies — For large wineries, ADI offers anaerobic systems that are ideally suited to treating high-strength wastewater generated at wineries, and provide an efficient, economical solution to wastewater problems. Wineries can recover the biogas generated in these systems and use it to displace electricity or natural gas use in the winery, providing an additional economic benefit.

Contact an ADI wastewater treatment expert today and explore a variety of solutions to handle wastewater treatment needs at your winery and improve the overall bottom line.

For more information, contact:
ADI Systems Inc.
Al Cocci, Vice President
182 Main St. Unit 6, Salem, NH 03079
tel: 800/561-2831 (US and Canada) or
603/893-2134; fax: 603/898-3991
e-mail: systems@adi.ca
website: www.adisystemsinc.com

PLEASE SEE ADI SYSTEMS AD, PAGE 35.

RANCH SYSTEMS LLC

Ranch Systems provides automated weather stations, irrigation control systems, and systems for soil moisture tracking and frost alerting. Instead of three or four systems for these functions, Ranch Systems lets growers get all from a low-cost single system, resulting in a more comprehensive solution.

Ranch Systems' cutting-edge wireless mesh networking telemetry equipment and Internet software interacts with a variety of sensors to gather and transmit vineyard information to a secure website. It also allows the wireless control of irrigation valves, and other equipment. Customers can view charts, set custom alerts and triggers, generate reports, and activate irrigation valves and equipment on-line, or download information to spreadsheets for their own calculations.

In 2008, Ranch Systems offers the RS200 family of two-way telemetry nodes, providing wireless in-field telemetry that can both collect data and control valves and equipment.

"With the RS200 family of nodes, growers finally have an economical way to deploy telemetry through-out their vineyards," states Jacob Christfort, president of Ranch Systems. "In addition to gathering weather data, RS200 nodes also control equipment, and generate frost alarms."

Ranch Systems now also offers the full line of AquaSpy soil moisture probes, for economical multi-level tracking of soil moisture for irrigation. In combination with the RS200 nodes, tracking of soil moisture is now feasible in multiple locations throughout a vineyard.

For more information, contact:
Ranch Systems LLC
885 Olive Ave. Ste A, Novato, CA 94945
tel: 415/898-5900
website: www.ranchsystems.com

PLEASE SEE RANCH SYSTEMS AD, PAGE 46.

PAIGE POULOS COMMUNICATIONS

One of the strongest teams in the wine industry, Paige Poulos Communications is respected for its creativity, drive, and bottom-line return on communications investments. The agency's range of services spans every aspect of business and direct-to-consumer interaction, from brand launches to in-market and on-site events to media relations. PPC also specializes in wine club restructuring and direct sales development, creation of meaningful sales tools, and internet evolution.

A leader in environmentally-conscious communications, PPC has definitive expertise in framing authentic green messages that resonate in today's marketplace.

For more information contact:
Paige Poulos Communications
64 Railroad Ave.
Pt. Richmond, CA 94801-3923
tel: 510/970-9777; toll-free: 800/497-3376
e-mail: info@paigepoulos.com
website: www.paigepoulos.com

PLEASE SEE PAIGE POULOS COMMUNICATIONS AD, PAGE 38.

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DAL POGGETTO & COMPANY CPAs

Dal Poggetto & Company LLP specializes in accounting, tax, and consulting services for privately-held businesses and their owners, with a particular emphasis in the wine industry. The firm's partners have been accountants and consultants since 1975, and have worked with companies of all sizes, with annual revenues under $50,000 to those with more than $500 million in annual sales.

The firm's services include profit-improvement studies; strategic planning; financial modeling; transaction consulting for mergers, acquisitions, and divestitures; tax strategies and business planning; and traditional services, such as auditing and accounting, tax planning and preparation, and accounting systems development and consulting.

The staff at Dal Poggetto & Company LLP have extensive wine industry experience and are frequently able to make cost and tax savings recommendations to clients. They have an excellent reputation for clear communication skills, technical abilities, and responsiveness to clients.

The high quality of the firm's practice is maintained by a program of formal technical training for staff that exceeds state licensure requirements and the programs of most other accounting firms. The most current technologies are employed to deliver client service in an efficient and cost-effective manner.

For excellent service at a competitive cost, provided by experienced professionals with broad consulting skills tailored to the needs of the wine industry, contact Dal Poggetto & Company LLP.

For more information, contact:
Dal Poggetto & Company LLP, CPAs
Jon P. Dal Poggetto, CPA
149 Stony Circle, Ste. 100
Santa Rosa, CA 95401
tel: 707/545-3311; fax: 707/525-3999
e-mail: info@dalpoggetto.com
website: www.dalpoggetto.com

WINEWEB ENTERPRISES, INC.

WineWeb® provides a suite of cost-effective services for wineries, including websites, e-commerce sales processing, point-of-sale, email campaign management and e-Marketplace promotion services. WineWeb can create and host a unique, effective, and robust website with their winery-specific content management system, unlimited email accounts, traffic statistics, blog and much more. Anytime-access to your content allows website maintenance by non-technical winery staff. Order fulfillment tools, custom data exports, and application integration reduce staff labor requirements.

WineWeb®

WineWeb's online order processing service is customized to the needs of wineries and includes fully compliant shopping cart, credit card processing, shipping carrier integration, age verification, fulfillment center routing, and order fulfillment tools. The e-commerce service can be integrated into an existing website, and includes both direct-to-consumer and direct-to-trade sales.

WineWeb services integrate with other winery applications, and provide tools to manage a winery's online sales channel and customer repository. Advanced features include multiple users, role-based security, event reservations and ticketing, gift certificates, sales dashboard and reporting module, with additional components for wine club member management, email campaigns, and affiliate sales.

Since 1995, WineWeb provides cost-effective Internet services to wineries. WineWeb provides small winery value with a large winery feature-set, with no contract commitment period. WineWeb earns its customers' business each month.

For more information, contact:
WineWeb Enterprises, Inc.
1 Stone Ridge Rd., Santa Fe, NM 87505
tel: 888/236-0058; fax: 888/236-1439
e-mail: sales@wineweb.com
website: services.wineweb.com

AKEENA SOLAR

Improve a vineyard's sustainability — and cash flow — with a solar electric system. Solar power benefits the environment by providing electricity produced from a clean, renewable resource.

Akeena Solar

The V. Sattui Winery project in St. Helena is a recent addition to Akeena Solar's growing list of farsighted winery customers who produce free electricity while, at the same time, protecting the environment. Other installations completed in the wine industry include: Lafitte Cork & Capsule, Silver Mountain Winery, Peay Vinyards, Topel Winery, Guenoc Winery, Clos Pegase, Von Strasser Winery, Cloudview Vineyards, Belvedere Winery, Rudd Winery, Mount Eden Vineyards, Cooper-Garrod Vineyards, Hagafen Cellars, Paloma Vineyards, Kent Rasmussen Winery, and Peju Winery.

Sustainability has become a vital focus for family-owned wineries in California. Solar electric power allows wineries to control one of the more expensive and typically unpredictable components of operating a winery: electric rates.

36 kilowatt case study: V. Sattui Winery

Total installation cost	$273,000
30% Federal Tax Credit	– $57,001
Renewable buydown rebate	– $82,997
Net Cost:	**$133,002**
Depreciation Tax Benefit (MACRS):	**$ 55,861**
PV System financial benefits	
First year energy savings	$6,771
Total energy savings (30 yr life)	$581,184
Locked in Net Cost/kWh (30 yr life)	$0.0904
Rate of Return:	**14.5%**

Akeena provides complete turnkey vineyard solar installations for wineries throughout Northern California. Call for a free site survey and financial report. Rebate funding and tax credits are limited.

For more information, contact:
Akeena Solar
16005 Los Gatos Blvd., Los Gatos, CA 95032
tel: 888/253-3628; fax: 408/395-7979
e-mail: info@akeena.net
website: www.akeena.net

BOXWOOD

Wineries each have their own DNA, containing the personalities and lives of the owners, winemakers, viticulturists, and vignerons. It is expressed in the wine they make, the label on the bottle, and the winery buildings themselves. Boxwood's collaborative process creates unique sustainable solutions that enhance this "self expression," marrying it with the terroir of a building site. Wine varies with ecology; so should the building where wine is made.

Joe Chauncey (Boxwood's founding principal) is as passionate about wine as he is about architecture. Joe and his wife are proud vintners of limited production Cabernet Sauvignon and Syrah in their own small winery. His first-hand knowledge of the winemaking process informs Boxwood's architectural planning along with the selection of materials and systems, finishes, and lighting.

Architecture, like winemaking, is a unique combination of art, pragmatics, and science. Boxwood's energy-efficient wineries are infused with natural light and sustainable materials, creating bright, healthy, safe working environments where winemakers thrive.

Boxwood's winery client list includes: Waters Winery (WA), Hedges Family Estates (WA), Obelisco (WA), Carlton Winemakers' Studio (OR), Nicholas Cole Cellars (WA), Col Solare (WA), Brian Carter Cellars (WA), Substance (WA), Hightower Cellars (WA), Éritage (WA), August Cellars (OR), Reynvaan Family Vineyard (WA), Mellisoni Vineyards (WA), Chateau Ste. Michelle (WA).

For more information, contact:
Boxwood
Joe Chauncey
1218 Third Ave. #1412, Seattle, WA 98101
tel: 206/343-0236; fax: 206/343-0241
website: www.eboxwood.com

SCION ADVISORS

Scion Advisors are family business advisors (**transition architects**), who work alongside winery owners to develop plans and structures to navigate complex business transitions with less risk and more confidence.

Seasoned executives with general management expertise, who have achieved results across 100 companies and several industries, comprise Scion Advisors.

Scion Advisors' proven approach is ideally suited to helping family business leaders realize maximum results on their hard work, to achieve a higher quality of life.

Scion Advisors

Scion Advisors has helped more than 50 wine industry clients to develop new sources of profitable growth, reposition their businesses for the future, sharpen their competitive advantage, and manage family business succession.

For more information, contact:
Scion Advisors
1339 Pearl St. #204, Napa, CA 94559
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e-mail: deborah@scionadvisors.com
website: www.scionadvisors.com

THE PERSONNEL PERSPECTIVE

Since 1987, The Personnel Perspective has partnered with wine industry owners and key managers, providing consulting with a focused expertise in Strategic Human Resources, Management Training, Executive Search and Recruiting.

The Personnel Perspective

With the branding message "Organizational Excellence Through People," the team of senior associates are experienced in understanding business strategy, management philosophy, culture, and work environment which, in turn, is reflected in project work and the placement of talented individuals who will fit, succeed, and thrive in each winery's unique culture.

Clients benefit from the Personnel Perspective's extensive wine industry experience and understanding of both the opportunities and challenges facing the wine industry, and the ability to provide realistic and creative solutions.

With strong industry roots, The Personnel Perspective has developed not only an extraordinary database of high caliber candidates, but also an extensive referral network of industry professionals, which is utilized during every search process.

The Personnel Perspective is an expert single-source provider with in-depth knowledge of executive placement and professional recruitment, compensation, human resources, and management training and team development, and is positioned to help wineries grow business with innovative solutions to organizational needs.

For more information contact:
The Personnel Perspective
575 W. College Ave., Santa Rosa, CA 95401
tel: 707/576-7653; fax: 707/576-8190
e-mail: carolyns@personnelperspective.com
website: www.personnelperspective.com

PLEASE SEE PERSONNEL PERSPECTIVE AD, PAGE 77.

Crochiere & Associates, LLC

Crochiere & Associates, LLC, a package testing and consulting service, offers wineries and wine package suppliers an independent source for the evaluation of bottles, closures, and bag-in-box for sealing reliability and barrier properties under commercial conditions. Filled package methods are used to evaluate leakage, oxygen ingress, carbonation loss, and contamination ingress in order to:

- Develop packaging materials;
- Insure reliability of the bottle-to-closure seal;
- Determine optimum closing conditions for capping machines;
- Select the right process, packaging and materials to provide a consistent and specific level of oxygen pickup and ingress;
- Trouble-shoot existing packaging problems.

The procedures and methods used have been adapted from those used in the beer, soft drink, and juice industry for decades.

Some examples of projects Crochiere has conducted include:

- Evaluating screw caps from numerous suppliers for the best and most consistent barrier properties, then establishing quality control specifications for closures;
- Evaluating plastic bottles and closures or bags and taps for oxygen ingress and oxygen scavenger useful life;
- Determining which crowns and liners offer the best barrier properties for carbonation loss, and oxygen and TCA ingress during cellar storage;
- Determine how well screw caps or crowns will withstand the abuse of warehouse stacking and damage to the sealing area;
- Design bottle and cap-fit to insure the cap-perform is reliable over the life of the package.

For more information, contact:

Crochiere & Associates, LLC
George K. Crochiere
55 Bancroft St., Pepperell, MA 01463
tel: 978/433-6067
e-mail: crochiere_assoc@hotmail.com

BevTrac Mobile Quality Systems LLC

BevTrac Mobile Quality Systems LLC (BevTrac) serves the wine industry by providing a mobile laboratory (a first in the wine industry) that conducts state-of-the-art analytical and microbiological testing onsite (plus a free courier service in Mendocino, Napa, and Sonoma counties).

In addition to laboratory services, BevTrac offers a wide range of consulting services for the wine industry:

- Microbial troubleshooting and remediation;
- Onsite sanitation assessments, monitoring, and solutions to prevent microbial spoilage of wine;
- Quality assurance assessments and services to help clients produce high quality, safe, and pure products;
- 2,4,6-trichloroanisole (TCA) and 2,4,6-tribromoanisole (TBA) assessment and remediation;
- Process optimization consultation (such as Six Sigma and Lean Manufacturing), to eliminate defects in the wine production process. This prevents product downgrades and rework, and increases operating efficiency.

BevTrac
Mobile Quality Systems LLC

From grape maturity to finished bottle distribution, BevTrac has the expertise and technology to implement the quality systems that will improve finished wine. For a complete overview of the company, call or visit the website.

For more information, contact:

BevTrac Mobile Quality Systems LLC
PO Box 1410, Windsor, CA 95492
tel: 800/401-8917; fax: 707/237-5125
e-mail: info@bevtracquality.com
website: www.bevtracquality.com

AmericanWinery.com

AmericanWinery.com is a premier destination for buying distinctive, American-made wines, direct from the winery. With over 2,000 wines available from over 350 wineries across the U.S., AmericanWinery.com offers the largest selection of domestic wine online. Every AmericanWinery.com purchase is "Select Direct," shipped directly from the winery of choice. AmericanWinery.com provides the most professional and reliable venue for wine consumers and winemakers to connect online.

AMERICAN
WINERY.COM

The company provides secure online transactions through its Consumer Direct Marketplace, customer service support for all orders, and dedicated online ad campaigns and product placement in major wine and consumer portals for all of its winery partners. Wineries benefit from attentive account managers who personally assist in the set up and activation of the account, and customer care.

In addition, wineries have complete control over how their wine is marketed and sold at AmericanWinery.com. Wineries set retail pricing and discounts, and make real-time changes and updates to tasting notes, product information, photos, event listings, and more. The result is that wineries have access to unprecedented marketing benefits while retaining maximum profits on their sales through American Winery.com.

AmericanWinery.com partners with ShipCompliant, TrustE, Verisign, IDology Age Verification, and the Better Business Bureau Online.

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PLEASE SEE HOYT SHEPSTON AD, PAGE 29.

Marketing Strategies

Continued from page 50

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NATIONAL GRAPE AND WINE INITIATIVE aggressively pursues *sustainability* agenda

BY Sharon L. Melmon,
Kennedy/Jenks Consultants

Unlike many competitive business sectors, the wine industry has a long history of working together to address common challenges. Now with climate change and the need for sustainability at the forefront, the industry has once again stepped up, via the National Grape and Wine Initiative (NGWI), to develop several projects that will go a long way toward helping wineries address environmental opportunities and achieve more sustainable operations.

NGWI has roots back to 2003, when a group of interested grape and wine industry members, academics, and research scientists came together to address a growing crisis in research funding within the industry, and to develop a process for establishing research priorities that would mutually benefit the industry and academic and research organizations. From those beginnings, the NGWI has developed detailed industry priorities and obtained momentum in several key areas:

- Understanding and improving quality;
- Consumer insights, nutrition, and community;
- Processing and production efficiency;
- Sustainable practices; and
- Extension and education.

While significant progress has been made on all fronts, the area of sustainability continues to be a primary focus nationally for the industry.

In 2008, the Sustainable Practices Research Theme committee (co-chaired by Tim Martinson of Cornell University's Cooperative Extension Services and Chris Savage, Director of Global Environmental Affairs for E&J Gallo Winery) was asked to create a working group, and to implement a set of projects that would help drive the wine industry further down the path of sustainability.

Three projects are under way in 2008, which the committee has confidence will drive positive change within the industry.

Project I: Integration of grape and grape product research and extension components into ongoing Agricultural Research Service (ARS) programs addressing climate change and environmental assessment. The intent of this project is to marshal ARS research already underway, and ensure that there is a grape/grape products industry component to the work. Much of the ARS research has applicability across many crops, and the grape/ grape products industry wants to benefit where possible.

Project II: Reductions of fixed dissolved solids (salts) in winery process wastewater through the reformulation of cleaning compounds to reduce and/ or eliminate the salt-creating component of the material. Non-degradable salts in wastewater are one of the single biggest issues affecting groundwater supplies in the arid western U.S. While the grape/grape products industry is a small component of the problem, an effort to address it, if successful, will further solidify the industry's focus on sustainable practices.

Project III: Outreach and development of an industry tool in 2007 and early 2008, *"Comprehensive Guide to Sustainable Management of Winery Water and Associated Energy."* This guide is designed to make it easy for all wine industry users, regardless of facility size, location, or experience with water and wastewater, to identify reduction opportunities within their operations.

The basis for much of this guide has come from work completed by the Wine Institute in the last five years. The first introduction of this tool was at the January 2008 Unified Wine & Grape Symposium in Sacramento, CA. The presentation was met with tremendous response, with a call by many for more details to understand exactly how the guide could be applied to their operations.

Building on this feedback, the remainder of this article provides further description of Project III, and its applicability to the wine industry.

Guide to improved winery water management

Winery water use, wastewater management, and associated energy demands have become a primary international focus for the grape and wine community. In an effort to address this need, the new guidebook aims to answer the fundamental question, "How do I make improvements to my winery or design a new winery, on my budget and my timeline?"

With unique operations, configurations, and objectives at each winery, a "cookbook" solution that is generalized to work in all cases would not be effective. Instead, the new guidebook provides a *methodology* for first evaluating how water is being used, then identifying options to improve efficiency, and finally selecting the best combination of changes to meet the winery's goals.

The methodology is divided into five steps. For each step in this process, the guidebook provides relevant guidance and timesaving support materials, such as data compilation worksheets, with additional supporting information included in appendices. Together, these materials make up a full package for holistic examination of water and wastewater management practices.

Five-step methodology for winery water operations

1. Planning and Organization
⇩
2. Assessment ←
⇩
3. Data Evaluation/Option Identification
⇩
4. Feasibility Analysis
⇩
5. Implementation
(**Monitor effectiveness and repeat for further reductions, as necessary.**)

End result: Sustainable winery wastewater operations

When the project was conceived, wine industry leaders realized that small wineries, in particular, would benefit from a manual with a do-it-yourself orientation. Small producers are often very enthusiastic about sustainability, but may not have an engineer on staff or the resources to hire a consultant. As a result, the guidebook was designed to allow winery managers who do not have a strong engineering background to understand and complete the evaluation process on their own.

Each of the five steps in the program is important, but the two initial steps set the stage for successful outcomes.

1. Planning for a successful program

The first step, planning and organization, addresses the need for a commitment from management to invest in this effort, and to set meaningful, measurable goals to reduce water use, decrease wastewater generation and strength, and reduce associated energy use.

While every winery's goals will be different, the industry is moving toward developing benchmarks for key metrics that wineries will want to aim for, such as water used per gallon of wine produced. These will be incorporated when available.

In the meantime, there is a consensus that wineries should be adopting the kinds of improvements that are relatively low in cost and effort to implement — the easy wins, so to speak, while also considering changes that may be more difficult as long-term goals.

2. Assessment

In the second step, the winery should aim to: 1) find out how much water is currently being used in each of their specific unit operations; and 2) assess the quality of the wastewater associated with each operation by collecting samples to submit to a laboratory for chemical analysis.

Compiled data will indicate where the winery should seek reductions, and which changes will be effective. The data will also be used to establish a baseline of current operations, so that when changes are made, the impact can be measured.

Measurable results are critical for justifying the winery's investment in any new equipment, and will help them decide whether they have done enough to reach their goals, or whether they need to make more aggressive changes.

The guidebook offers extensive resources to support this step, as summarized on the Work Flow Map included in the document (see excerpt). For example, the assessment section discusses typical winery wastewater streams individually, and provides information on the kinds of samples that will be appropriate. If winery staff have never installed a flow meter or collected a water sample before, they can refer to a more fundamental guidance section on those methods.

Figure I: Excerpt from Work Flow Map (Sustainable Winery Practices Document).

Step 2. Winery Self-Assessment

2.1 Compile existing facility information
2.2 Collect additional information

Step 2. Tools

Worksheets

2-1 Water use inventory
2-2 Sanitation inventory
2-3 Equipment inventory
2-4 Flow monitoring plan
2-5 Flow monitoring results
2-6 Analytical monitoring plan
2-7 Analytical monitoring results

Other useful materials

Guideline 1: Data collection
Appendix A: Case study
Appendix B: Source water quality treatment
Appendix C: Wastewater sources and characteristics
Appendix D: Cleaning and sanitation

Worksheets for the assessment step will be useful for conducting inventories of current water use and sanitation practices. There are also worksheets that can be used to develop flow monitoring and sample collection plans, including the number of

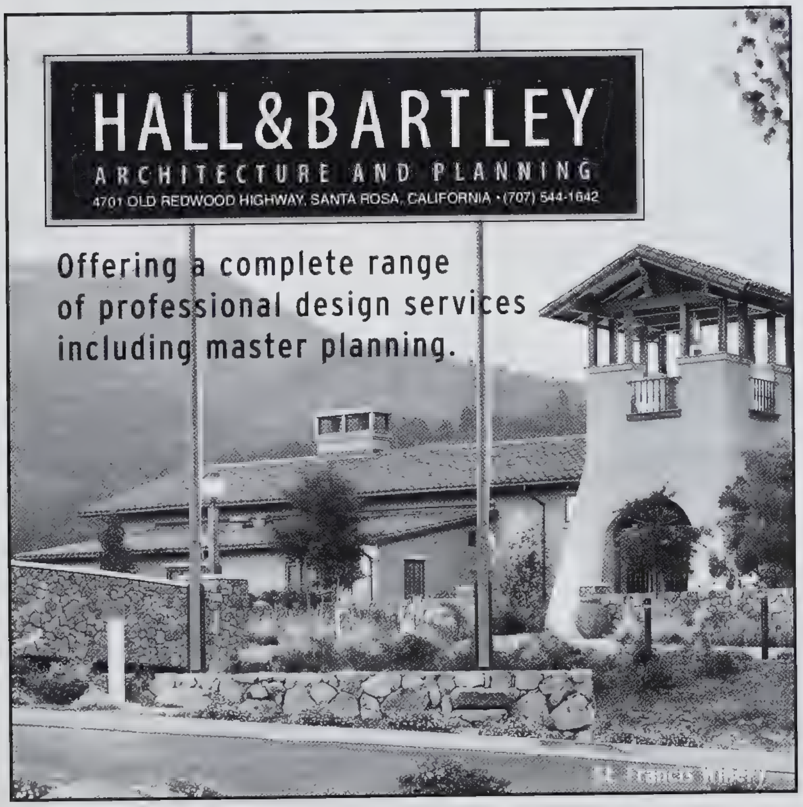
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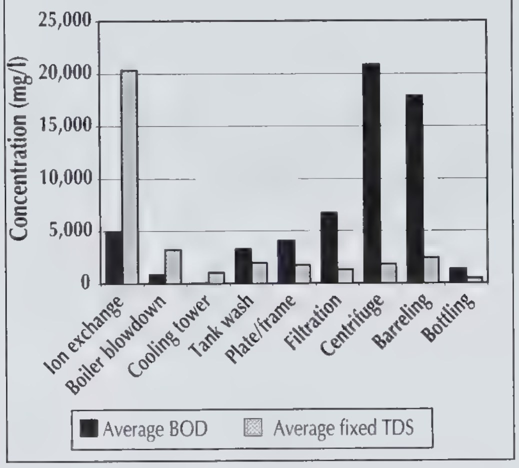
Figure II: Average wastewater concentrations of BOD and fixed dissolved solids at several large wineries



BOD — Biochemical Oxygen Demand, the measure of the biodegradable organic components in the wastewater.
Fixed TDS — Fixed Dissolved Solids, an approximate measure of the amount of inorganic salts (Na. K, etc.) in the wastewater.

samples to be collected from unit operations, costs, and other parameters.

In addition, worksheets are provided to summarize results, including laboratory analytical data. Some of the worksheets calculate outputs that are needed for later decision making. All worksheets were designed to be scalable for use by a winery of any size; they will work just as easily for a large winery with many processes and wastewater streams as for a small winery.

For reference during the assessment and data evaluation steps, the guidebook provides a "case study" of characterization data compiled from several large wineries. These data, obtained from prior Wine Institute research, show the average chemistry of wastewater streams from a series of individual unit processes (such as crushing, filtration, bottling). They also provide an indication of which operations use the most water and which are sources of the highest concentrations of chemical constituents in wastewater.

Although direct measurement of wastewater chemistry and flows is recommended, if a winery cannot afford to sample the wastewater from all of their individual operations, the reference data can potentially be used as a substitute to estimate wastewater quality.

But winery wastewater streams can be extremely variable, and the guidebook notes that substituting reference data could cause a winery to miss seeing the full picture of their own sources. This may lead to errors in the evaluation and selection of improvement options. As a result, a fairly intensive wastewater sampling program is suggested to ensure that improvement action plans are well targeted and effective.

3. Data Evaluation and Option Identification

When a relatively complete data set has been obtained or estimated, a winery can turn to the guidance provided for evaluating the data and identifying options to reduce water use, and wastewater generation and strength.

It may be possible to separate the wastewater streams into reuse categories, ranging from good quality water that can be substituted for source water, to water that is essentially not reusable and will require offsite disposal. These categories will make it easier to identify the "low-hanging fruit" for immediate action.

The manual includes lists of improvement options that will be applicable at many wineries and criteria for screening the options to identify those that are the most promising.

4. Feasibility Analysis

In the feasibility analysis step, the winery will complete a more detailed evaluation of the options remaining after the screening process. This effort includes a detailed evaluation of costs. Worksheets are also provided to facilitate these calculations. After the best options have been defined, the winery can prepare an action plan for implementation.

Table I: Worksheet

Option Description

Use this worksheet for preliminary evaluation of a potential option

Option Name:

Description:

Summary of Requirements/Impacts	Yes	No	Comments
Equipment change			
Procedural change			
Chemical/material change			
Reduce water use			
Reduce process water volume			
Reduce process water loading			
Reduce energy use			
Affect wine production processes			
Results in new waste stream or by-product			
Requires significant capital investment			
Other requirement/impact			
Feasibility analysis warranted			
Rationale for proceeding to feasibility analysis, or aborting			

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5. Implementation

Because the scope of implementation will be different for each winery, the instructions for the final step are limited. But the guidebook notes that a monitoring program should be launched when the options are put in place. Ongoing monitoring is critical to deciding whether the housekeeping changes and/or installed equipment are leading to the desired results. If not, the program calls for the winery to cycle through the sequence of steps again, identifying and implementing more options until their goals are met.

There is little dispute that now is the time to be looking more closely at winery water use, wastewater management, and associated energy demands. This new tool will help wineries accelerate their progress toward sustainability. ■

Leafroll

Continued from page 15

tions of grape mealybug have not been observed in Napa Valley and the presence of vine mealybug has not been documented in vineyards that experienced a rapid spread of leafroll virus. The "vector factor" was discounted as the likely cause for the spread of the virus that was seen in this study.

The second factor identified as a possible facilitator of the rapid spread of leafroll virus in Napa is the use of new rootstocks in the post-phylloxera period after the 1990s. Previous generations of vineyards in Napa Valley were planted primarily on AXR#1 or St. George rootstocks, which are much more tolerant to leafroll infection than are the 10 to 15 rootstocks that are now commonly in use.

It is critical, at the present time, for the vineyard environment to remain free of leafroll virus, due to the susceptibility of rootstock selections planted today. It is possible that leafroll virus has always been present in Napa vineyards, but that the symptoms were not obvious due to rootstock-tolerance of the virus.

The final factor proposed as the cause of the apparent increased rate of leafroll virus spread is the possibility of new forms of the virus in California.

New, more readily transmittable strains of the virus (subsets within a species) could have been inadvertently introduced to California on grape cuttings that were smuggled into the state, bypassing quarantine procedures. This is a reasonable inference for the cause of leafroll spread given the number of illegal grapevine importations known to have occurred in California in the past 20 years. Furthermore, a new strain of one of the GLRaV isolates could gradually mutate to a more aggressive form than its relatives.[4]

Careful monitoring of leafroll disease and mealybug activity in California is critical. A collaborative effort is planned by UC Davis scientists and industry researchers to monitor and evaluate the interrelationship between existing GLRaV species isolates and mealybug species in California. The research effort will be guided by FPS scientists Golino, Rowhani, and Sue Sim.

An extensive vineyard will be planted in the Plant Pathology research block at UC Davis with vines and rootstock artificially inoculated with various combinations of leafroll and other viruses. The goal is to study the symptoms and effects of various species of leafroll virus on grape scions grafted onto different rootstocks.

Golino and Rowhani are looking forward to the opportunity of learning more about the effects of leafroll and the diversity of this important group of viruses. The full study may take as many as 20 years to complete, but answers to many questions about leafroll virus should be apparent within the first few years. ■

Acknowledgments

I would like to express my appreciation to Dr. Deborah Golino, Dr. Adib Rowhani, and Susan Sim for their helpful input on and review of this article.

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November 5
Napa Valley Viticultural Fair
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November 13

9AM Laws/Regulations Update: people, pests and purpose, Leonard Robinson (Chief Deputy Director, CA Dept. of Toxic Substances Control, EPA); Hot topics in ag labor, George Daniels (Executive VP, Farm Employers Labor Service); LBAM — program, concerns, and regulations, Dr. Robert Dowell (Director, LBAM Eradication, CA Dept. of Food & Agriculture).

11AM Simultaneous Seminars — Food Safety/ Water Quality: conflict, compromise, and conversation, Michael Cahn (Farm Advisor, UCCE), Hank Giclas (VP, Science/ Technology, Western Growers Assn.), Kay Mercer (Executive Director, Santa Barbara Ag Coalition), Daniel Mountjoy (Resource Conservationist, Natural Resource Conservation Service), Joe Pezzini (Ocean Mist Farms, Board Chair of Leafy Green Marketing Agreement), Trevor Suslow (Extension Research Specialist, UC Davis).

Nursery & Floriculture — Minimizing water quality impacts at nurseries, Jay Gan (Professor/Dept. Chair, UC Riverside); Veriflora — certified sustainable cut flowers, Annie Gardiner (Veriflora Sustainability Council).

Viticulture Research Update — New developments in sustainable mite management in vineyards, Mel Stavrinides (PhD. Candidate, UC Berkeley); Near-infrared spectroscopy and differential wine grape harvesting, Robert Wample (Chair, Dept. of Viticulture & Enology, CSU Fresno).

12:30PM Keynote Address Luncheon — California and the future of food, wine, and community, Michael Dimock (President, Roots of Change).

1:30PM Simultaneous Seminars — Food Safety and Water Quality: conflict, compromise, and conversation (continued).

Taking action — Water monitoring and pump energy evaluations/the importance of understanding, interpreting, and acting on pump efficiency tests, Pete Canessa (Irrigation Specialist, Center for Irrigation Technology, CSU Fresno); Low-tech, low-cost soil moisture monitoring and interpretation, Michael Cahn (Farm Advisor, UCCE).

Certification programs for sustainable agriculture/brief history of sustainable certifications and the protected harvest program, Dan Sonke (PhD. Plant Medicine, Senior Scientist, SureHarvest); Certified Sustainable by Food Alliance, David Vischer (CA Program Manager, Food Alliance); Certified sustainability in practice, Jill Whitacre (Program Coordinator, CCVT).

3:30PM Here comes the sun — renewable energy, footprints, lifecycles, and credits/ renewable energy potential from CA agriculture, Lynn Hamilton (Cal Poly State University, SLO); Farm to Fork — definitions, descriptions, and research update, Gail Feenstra (E.D., R.D. Food Systems Analyst, Sustainable Ag Research & Education Program); Carbon credit potential for agriculture, Cynthia Cory (Environmental Affairs, California Farm Bureau Federation).

5PM Exhibitor Showcase/wine and hors d'oeuvres reception.

November 14

8AM Simultaneous Seminars: Dietary guidelines for plants — smart, cost-effective nutrient management/agronomic, economic, and environmental concerns, Lowell Zelinski (President, Precision Ag Consulting); Hot topics and results, Robert Mikkelson (Western Director, International Plant Nutrition Institute); Nutrient management impacts on water quality — Central Coast update, Kirk Schmidt (Executive Director, Central Coast Water Quality Preservation).

Viticulture research update (continued) Breeding rootstocks for California vineyards, Andrew Walker (Professor of Viticulture UC Davis); Vineyard cover crops and tillage — Effects on soil microorganisms and function, Kerri Steenwerth (Soil Scientist, UC Davis); Influence of soil type and changes in soil solution chemistry during the growing season on vine growth parameters and grape/wine quality, Jean-Jacques Lambert (Assistant Research Soil Scientist, UC Davis).

10:30AM Leading by example — Sustainability initiatives in the marketplace: Chris Arnold (Chipotle); West and East Coast Wine Buyers, Whole Foods; Wal-Mart Sustainability Program.

1PM Succession planning for California farmers/ranchers co-sponsored with California Farm Link: Introduction to succession planning; Family farm succession tools, Nuts and Bolts; Family communication strategies, Conducting an effective business meeting; Stakeholder specific breakout sessions.

Registration is available online at www.sustainableagexpo.org.

January 27–30, 2009
Unified Wine & Grape Symposium
Sacramento Convention Center
Sacramento, CA

Unified Wine & Grape Symposium 2009 will be extended from a three-day program to a fourth day. Program presentations start on January 27 and run through January 30, with a full-day Aroma Symposium. "Expansion to Friday offers guests a larger program and the time needed to give Aroma the comprehensive attention it merits," says Dr. John Thorngate (Unified Program Development Committee Chair).

With increased consumer consciousness about carbon footprints, environmental practices, and energy efficiency, a Tuesday session will explore sustainable practices. More sessions cover topics such as: economics of sustainable practices, practical aspects of retrofitting wineries to be more "green," and how to effectively communicate a commitment to sustainability.

"We're putting together a program that addresses the alignment of sound business practices with consumer expectations of environmental practices while maintaining profitability," adds Thorngate. "It's not enough to say you're green, you have to show how you're green."

More highlights include a viticulture session on lessons learned to maximize vineyard production, marketing issues relevant to growers and wineries of all sizes with an emphasis on understanding millennial interests and communication styles, and a joint winemaking/grape growing Grenache session and tasting.

Jointly presented by the American Society for Enology & Viticulture and the California Association of Winegrape Growers, Unified Symposium is built with the collective input of growers, vintners, and allied industry members to serve as a clearinghouse of information important to wine and grape industry professionals. For more information, please call 530/753-1342 or go to www.unifiedsymposium.org on the Internet.

by Robert Tracy with Bevan Skaalen

Instituting a winery sanitation program

In the food and beverage industries, an effective and efficient sanitation program is a critical element in improving and maintaining high quality products. Sanitation is the practice of enhancing product quality and shelf life by suppressing microbial cell growth (such as mold, yeast, and bacteria) to an acceptable level. It is an applied science that incorporates the principles of microbiology, chemistry, engineering, and environmental sciences to establish practices and solve problems.

Keep in mind that the practice of sanitation is different than the practice of sterilization. Sterilization kills 100% of the microorganisms present, and in the dairy, meatpacking, and fruit juice industries, it is required, since some microorganisms pose a serious or even fatal health risk to humans.

In a winery environment, however, sterilization is difficult to achieve due to a lack of controlled environments, and it is generally not required, since the microorganisms growing in wine are not human pathogens. In addition, there are times in the winemaking process when microorganisms are essential — during fermentation, for example.

Though winery equipment does not require sterilization, it is critical that all materials (such as stainless steel, oak cooperage, hoses, etc.) coming into contact with fruit, juice, and wine be properly cleaned and sanitized to prevent spoilage microbes from accumulating and subsequently proliferating. While few microbes can survive in wine due to its alcoholic and acidic environment, most of those that can survive will cause spoilage.

This column focuses on the microbiological aspects of winery sanitation: sources of wine microbe contamination in the winery environment; the major factors affecting growth of wine microbes; spoilage threat of wine microbes; selecting cleaners and sanitizers for the winemaking process; how to test the adequacy of cleaning and sanitizing agents; and how a winery can establish microbiological criteria for winery sanitation practices.

Sources of wine microbe contamination in winery environment

Unfortunately, there are many sources of microbial contamination in a winery environment, from grape receiving all the way through bottling. Grapes themselves naturally harbor microbes (such as *Acetobacter*, *Candida*, *Pichia*, *Kloeckera*, *Kluyveromyces*, *Lactobacillus*, *Metschnikowia*, and *Pediococcus* spp.) that can cause wine spoilage if not properly managed during the winemaking process. This natural microflora can be influenced by a variety of factors, including grape health, temperature, soil, rain, grape variety, and/or pesticides.[1]

In addition to the fruit, the equipment used to harvest and transport it to the winery, such as mechanical harvesters, gondolas, and picking bins, must be routinely cleaned and sanitized. Once fruit is in the winery, all fruit and wine contact surfaces can act as sources of microbial contamination, if they are not properly cleaned and sanitized. Such surfaces include stainless steel equipment (tanks), oak cooperage, rubber or polyethylene transfer hoses, silicone bungs, rubber gaskets, Teflon-containing equipment, and glass.

Insects, such as fruit flies are another potential source of contamination. Additionally, wine microbes can be transferred to wines from the bodies of insects, so it is essential to clean up all spilled juice, must, skins, seeds, and wine before insects start thriving on them. It is prudent to keep tanks, barrels, and other storage containers covered as much as possible to limit access by insects.

Wine obtained from other facilities can be contaminated, so it is critical that each wine brought into your facility from an outside source be tested for wine spoilage microbes before introducing it into production.

The importance of a rigorous sanitation program cannot be emphasized enough. Due to the prevalence of potential spoilage microbes in the environment (such as airborne, fruit, insects, etc), it is virtually impossible to prevent these microorganisms from the entering the winery. However, although they are ubiquitous, an effective and routine sanitation, in conjunction with prudent winemaking practices, can significantly minimize and even eliminate the chance of wine spoilage.

Major factors affecting growth of wine microbes

Once equipment or product becomes contaminated with wine microbes, many factors can affect their growth. Winery personnel must know what these factors are, so they can limit growth. Major factors influencing wine microbe growth are:

Table I: Spoilage caused by wine microorganisms

Types of spoilage	Wine microorganisms
Excessive volatile acidity, primarily as acetic acid	*Brettanomyces*, *Candida*, *Kloeckera*, *Pichia*, *Zygosaccharomyces*, *Acetobacter*, *Lactobacillus*, and *Oenococcus* spp
Ethyl acetate	*Candida*, *Kloeckera*, *Metschnikowia*, and *Pichia* spp
Mousy taint	*Brettanomyces* and *Lactobacillus* spp
Secondary fermentation in bottle	*Brettanomyces*, *Saccharomyces*, *Schizosaccharomyces*, *Zygosaccharomyces*, *Lactobacillus*, *Oenococcus*, and *Pediococcus* spp
Yeast film on wine surface	*Candida* and *Pichia* spp
Acetaldehyde formation	*Candida*, *Metschnikowia*, *Pichia*, and *Saccharomycodes* spp
Diacetyl formation	*Lactobacillus* and *Pediococcus* spp
Increased viscosity	*Pediococcus* spp
Formation of ethyl carbamate precursors	*Saccharomyces*, *Lactobacillus*, and *Oenococcus* spp
Formation of biogenic amines	*Brettanomyces*, *Candida*, *Kloeckera*, *Metschnikowia*, *Saccharomyces*, *Lactobacillus*, *Oenococcus*, and *Pediococcus* spp
Formation of TCA (2,4,6-trichloroanisole) and TBA (2,4,6-tribromoanisole)	Caused by various molds including *Acremonium*, *Chrysonilia*, *Cladosporium*, *Fusarium*, *Penicillium*, and *Trichoderma* spp

pH, oxygen availability, nutrient availability, storage temperature, moisture availability, lag time, and generation time.

The growth of wine spoilage microbes can be dramatically affected by pH. Higher pH environments (above 3.8) are problematic for wineries for two reasons: 1) they favor the growth of wine spoilage microbes, such as lactic acid bacteria, and 2) they increase the amount of bound sulfur dioxide, which reduces the amount of microbiologically-active molecular sulfur dioxide.

Table II: Advantages and disadvantages of cleaners used in wine industry

Cleaner	*Advantages:*	*Disadvantages:*
Acid cleaners (phosphoric acid)	• Reduce mineral deposits (hard water stains, rust) • Soften water	• Not very effective at removing soils • Can be corrosive to stainless steel
Caustic cleaners (NAOH or KOH)	• Effectively cleans heavily soiled equipment (including hardened tartrates) • Removes wine stains • Have some anti-microbial activity • Can potentially be used multiple times • KOH is environmentally friendly	• Can pose a safety risk • Can be corrosive on stainless steel above recommended concentrations
Foam or gel cleaners	• Remain in direct contact with surface for long periods of time • Can be used on horizontal or vertical surfaces	• Require additional purchases of equipment • Chemicals can be expensive
High pressure spray cleaner	• Effectively cleans heavily soiled equipment	• Does not effectively remove long-term stains • Aerosilizes microorganisms • Can cause equipment malfunctions by penetrating into sensitive areas (electrical)
Sodium percarbonate cleaner with hydrogen peroxide	• Also called "oxygen bleach" • Effectively cleans and bleaches lightly soiled equipment • Dissolves rapidly in water • Rinses off easily • Considered a strong fungicide	• Not as effective as caustic cleaners on heavily soiled equipment
Trisodium phosphate (TSP) cleaner	• Effectively cleans lightly soiled equipment • Phosphates help soften water	• Low solubility in ambient-temperature water • Not a good destaining agent • Not environmentally friendly (phosphate content)

Oxygen availability be minimized as much as possible during the ageing process to prevent oxidative growth of microbes, such as *Acetobacter aceti* and surface film yeast (*Pichia* and *Candida* spp.) Oxygen availability must be minimized in tank and barrels by routine topping and maintaining an anaerobic headspace.

To minimize potential nutrients for spoilage microbes, a winery should immediately remove all grape waste products and make sure that primary and secondary fermentations are completed in a timely manner. Effectively managing these fermentations will significantly reduce the availability of nutrients for spoilage microorganisms.

Wine microbe growth can be stimulated under elevated storage temperature conditions (above 60°F), so on completion of malolactic fermentation, place wines in a controlled environment at a temperature less than or equal to 60°F (16°C).

In an environment where wine is being stored for the long-term, it is also important to control the level of available moisture in the atmosphere (relative humidity). Excessive moisture provides an ideal environment for the growth of bacteria, yeast, and mold on winery infrastructure, equipment exteriors, and oak cooperage exteriors.

Two factors that are critical for microbial growth are lag time and generation time. Lag time is the amount of time required for microorganisms to achieve log growth phase (exponential phase of cell growth characterized by time period in which cell number continually doubles in size until nutrients are depleted and/or toxic products accumulate). Generation time is the time required for microbes to double their population. Under ideal growth conditions, the lag time and generation time can be very short, leading to quick spoilage of wine product. Proper management of the factors discussed above and an effective sanitation program will minimize and even prevent conditions that allow a short lag time and generation time.

Spoilage threat of wine microbes

In the absence of an effective sanitation program, the residue of fruit, must, juice, skins, seeds, or wine may serve as sites for accumulation and growth of wine microbes. Growth of these microorganisms can subsequently lead to the deterioration and spoilage of wine products. Table I shows the types of spoilage caused by the presence of wine microbes.

Selecting cleaners and sanitizers for the winemaking process

Sanitation is a three-step process that includes cleaning, rinsing, and finally, sanitizing. Cleaning is the physical process of removing visible debris or soils (wine, juice, tartrates, fruit, lees, and fining agents) either manually (scrubbing) or mechanically (spraying). To help facilitate the cleaning process, it is helpful to use detergents in cleaners to penetrate, dislodge, and carry away dirt and debris.

Table III: Advantages and disadvantages of sanitizers used in wine industry

CHLORINE

Advantages:
- Very effective; used in the wine industry for decades

Disadvantages:
- High TCA formation risk — not recommended in a winery setting

CHLORINE DIOXIDE

Advantages:
- Broad spectrum of anti-microbial activity
- Effective over a wide pH range
- Breaks down biofilms and inhibits their formation
- Chlorine is not formed by current methods used to produce chlorine dioxide in the wine industry

Disadvantages:
- Can require an initially large upfront capital investment
- Vapors from activation step can be a safety hazard

HOT WATER

Advantages:
- Strong and broad antimicrobial activity
- Sanitizes cracks and non-contact surfaces via heat conduction
- Improves effectiveness of winery soil removal

Disadvantages:
- Expensive energy costs, maintenance and capital costs to install
- Requires more time to sanitize a surface than chemicals
- Can encourage biofilm formation by baking material on surfaces

IODOPHORS

Advantages:
- Strong antimicrobial activity (including spore-formers)
- Effective against broad range of microbes
- Easy to use
- Effective at low concentration levels (25 ppm)
- Non-corrosive

Disadvantages:
- Cost
- Possible odor and/or flavor concerns if it gets into product
- Staining of surfaces
- Most effective in a narrow pH range (40 to 50)

OZONE

Advantages:
- Powerful anti-microbial activity
- Requires very little contact time
- Potency of activity is not affected by pH or temperature
- Breaks down biofilms

Disadvantages:
- Poor solubility in water
- Very short half-life
- Corrosive
- Reacts with organic material
- Can be toxic so use requires safety monitoring
- Cannot be stored for later use
- Initial cost for equipment

continued

Table III continued

PEROXYACETIC ACID

Advantages:
- Strong antimicrobial activity over wide pH range
- Highly effective against broad range of microbes
- Degrades biofilms
- No post-rinse required
- Environmentally friendly

Disadvantages:
- One of the most expensive chemical sanitizers
- Concentrated form has a strong odor and is toxic
- Corrosive to metals such as copper and aluminum

QUATERNARY AMMONIUM COMPOUNDS (QUATS)

Advantages:
- Stable over a wide range of pH and temperatures
- Long-term residual action
- Good protection against mold growth
- Does not require rinsing
- Non-corrosive

Disadvantages:
- Lack of broad-spectrum activity against microbes (especially Gram-negative bacteria)
- Inactivated by salts and low pH
- Leaves residual film; best for external and non-food surfaces

SULFUR DIOXIDE (acidulated)

Advantages:
- Long shelf life
- Low cost to use

Disadvantages:
- Anti-microbial activity is only effective at low pH (30 to 40)
- Does not have a broad spectrum of antimicrobial activity
- Very corrosive in presence of moisture

After the surface is effectively cleaned, it is rinsed with water to remove residual debris and chemicals. Finally, once the surface is visibly clean, a sanitizer can be used to kill the microorganisms present. It is worth noting that sanitizers by themselves cannot be used to effectively remove dirt, debris, and soils from surfaces; they will only kill microbes on the outside layer of the debris and will not penetrate to the surface you are trying to sanitize.

Depending on the stage of the winemaking process, a variety of cleaners can be used. Table II shows the types of cleaners along with their advantages and disadvantages.

Like cleaners, many different sanitizers are available for use in a winery setting. Table III shows the types of sanitizers with the advantages and disadvantages of each.

Do not limit yourself to one option for cleaners and sanitizers. Within the winery, there will always be different situations that will dictate having a variety of cleaners and sanitizers available:

- A particular cleaner will be effective at removing debris from lightly soiled tank interiors, but will have difficulty cleaning heavily soiled tank interiors.
- Certain sanitizers are more effective against particular microbes than others.
- Removing a wine microbe from a bottling line may require a different sanitizer than eliminating it from oak cooperage.
- Removing a biofilm (a complex aggregation of microbes that are attached and growing on a solid substrate and are encapsulated within an extracellular matrix of polymeric substances) from a surface requires a different sanitation regime than just removing microbial cells from a surface.
- Microorganisms can build up a resistance to a particular sanitizer, so the sanitizers used in a winery must be changed out periodically.

Table IV: Reference guide for sanitation monitoring methods

Method	Advantages	Disadvantages	Recommended frequency*
Visual monitoring	• Can be completed quickly • All employees can employ technique • No cost	• Extremely subjective • Cannot be used to reliably determine sanitary condition	Each use
Adenosine triphosphate (ATP)	• Results are quantitative • Immediate results	• Does not indicate type of microbes present • Difficult to correlate ATP and microbial swabbing results	Daily/Weekly
Microbial swabbing/culturing	• Can quantify number and type of microbes present • Can be used to trend sanitary condition of facility/equipment	• Results not available for 4 to 7 days	Weekly/Monthly/Quarterly

* Varies by equipment/facility size/risk

Testing adequacy of cleaning and sanitizing agents

It does not matter how much time and effort is spent cleaning equipment if the methods are not effective. Therefore, the selection of cleaning and sanitizing agents for a winery requires that winery personnel test the efficacy of the cleaners and sanitizers on the various wine spoilage microbes and determine what impact the cleaning and sanitizing agents are having on equipment/materials.

The effectiveness of cleaners can be evaluated and verified using a combination of sensory inspection and adenosine triphosphate (ATP) testing. Sensory inspection, which is a qualitative method, involves using three of the five senses to assess the effectiveness of cleaning: visual (does surface look clean?), smell (does surface smell clean?), and touch (does surface feel clean?).

ATP testing is a real-time quantitative method to measure cleanliness of a surface. ATP, a chemical found in all animal, plant, and microbial cells, and in product residues (such as juice and wine), is measured by a process called bioluminescence (production of light by a living organism as a result of a chemical reaction). A surface is tested for ATP to determine whether microbe cells are present or were present in the recent past. While the ATP test is an effective method to measure surface cleanliness, it does not indicate what type of microbes are present.

The effectiveness of sanitizers can be evaluated and verified by aseptic swabbing of a surface, plating, and subsequent culturing of microbes that are present. This test will tell a winery whether or not the surface has microbes, and if so, what types of microbes are present (such as yeast, bacteria, mold).

All three methods offer their own particular strengths and should be used in combination to identify sanitation gaps and verify the efficacy of a sanitation program. Table IV provides a quick reference guide for the three primary sanitation monitoring methods.

Once sufficient historical data have been collected and evaluated for all of the tested cleaners and sanitizers, then the winery can identify where they work the best in the process.

Establishing microbiological criteria for winery sanitation practices

Once a sanitation program has been established and successfully implemented for an extended period of time (six to 12 months), a winery will have developed a significant volume of historical data on the results of ATP and microbiological swabbing/culturing tests. This data and scientific literature, acceptable levels of ATP and microbial loads can be established for winery materials, surfaces, and equipment.

After acceptable limits (or control limits) have been established for ATP and microorganisms, then routine sanitation audits of winery equipment must be conducted to ensure that cleaning and sanitation practices are continually effective. If the sanitation audits show levels of ATP or microbes that are above the acceptable limit, then a corrective action must be implemented (such as subsequent cleaning and/or sanitizing, root cause analysis, etc).

Conclusion

As demonstrated in this column, microbiology plays a fundamental role in understanding, developing, implementing, and maintaining winery sanitation. Benjamin Franklin once said: "An ounce of prevention is worth a pound of cure." This statement sums up exactly how an effective sanitation program can impact overall wine quality.

Because, although establishing/implementing and maintaining an effective sanitation program can take considerable effort and some upfront investment, there can be countless benefits to include improved wine quality, reduced rework, and more effective use of winery time and resources. ■

Footnotes

1. Pretorius, I.S., T.J. Van Der Westhuizen, and O.P.H. Augustyn. "Yeast biodiversity in vineyards and wineries and its importance to the South African wine industry." *S. Afr. J. Enol. Vitic.* 20: 61–74 (1999).

Dr. Robert Tracy, with nine years of scientific research experience and seven years of winery laboratory and quality control/-quality assurance experience, specializes in wine chemistry and microbiology, winery sanitation, and QA/QC. He is co-founder of BevTrac Mobile Quality Systems LLC, based in Windsor, CA (www.bevtracquality.com), providing a mobile wine laboratory and consulting services to the wine industry. Please direct inquiries to robert.tracy@bevtracquality.com or tel: 707/239-8581.

Bevan Skaalen has eight years' experience implementing quality assurance/control techniques in the biotechnology and wine industries. He specializes in QA/QC programs, and process optimization techniques. He is the co-founder of BevTrac Mobile Quality Systems and can be reached at bevan.skaalen@bevtracquality.com or tel: 707/239-8579.

SMART VITICULTURE *by Dr. Richard Smart*

History repeats itself with grapevine breeding

About one century ago, European vineyards were threatened by a seeming multitude of diseases and pests that had been introduced accidentally from the New World of America. Downy and powdery mildew and then phylloxera all took their dreadful toll — the European vinifera wines had no natural tolerance.

Phylloxera stimulated heated debate about how best to address this destructive pest. One school of thought suggested crossing (hybridizing) the European grapes, for their superior winemaking ability, with American species, for their phylloxera tolerance.

The second approach urged grafting European vines to the American species. This second solution has become the dominant commercial practice. It must surely be one of the most outstanding examples in agriculture of a genuinely "organic" approach to pest control.

Meanwhile, the frenetic breeding program begun more than 100 years ago produced the so-called generic group of "French hybrids," which fell into disrepute in the 20th Century. They were, in general, as remarkable for poor wine quality as they were for fungal disease tolerance and high yields, so their production is now discouraged and even illegal in parts of Europe. But those hybrids reflected the technology of their day.

Grapevine breeding today

Grapevine breeding seems to be making a comeback, as a solution to today's disease and pest problems. I offer two examples.

The dreaded bacterial Pierce's disease (PD), is a known killer of European vinifera vines that is moving northward through California's vineyards. While PD has been in North Coast vineyards for decades, damage has been restricted by the limited flight range of the insect vectors that inhabit riparian areas near vineyards. This has all changed with the recent arrival of the "mega-vector," the Glassy Winged Sharp Shooter (GWSS), which is capable of carrying the disease over long distances.

Quarantine efforts are currently keeping this insect out of North Coast vineyards, but there is no guarantee for the future. What then? Will PD mean the demise of the Napa Valley and Sonoma County wine industry?

Not if Professor Andy Walker (University of California, Davis) has his way. A recent article in *PWV* (May/June 2008) described his remarkable vine breeding research. Dr. Walker only began breeding wine grapes in 2004, yet by Fall 2008, he will have new varieties available as seedlings. They have 94% PD tolerance and superior wine quality. He has used all important varieties as parents in his winegrape breeding program.

Dr. Walker's extraordinary progress has been due to good science, in my opinion. He has studied the genetics of PD tolerance and found a single dominant gene for PD tolerance in the native species *Vitis arizonica*, which means that 50% of its progeny in a cross will be PD-tolerant. By continued backcrossing, he is able to maintain vinifera wine quality while increasing PD tolerance.

The program has been aided by another discovery, that of a "marker" gene for PD tolerance. This marker gene allows seedlings to be quickly and cheaply screened for PD tolerance. Dr. Walker next plans to introduce mildew tolerance to these varieties. Can you imagine, vines tolerant to PD and also mildew!

Other American vine breeding

Geneva Experiment Station (in upstate New York) has an even larger winegrape breeding program. Five scientists are involved in the Grape Genetics Research Unit, where not only new varieties but also new rootstocks are bred. Breeder Dr. Bruce Reisch continues to release new varieties, producing some 4,000 seedlings per year.

Many of the European rootstocks we now rely on were bred in that frenzy of breeding that began a century or so ago. However, there have been few recent releases. In Australia at the moment, there is interest in breeding new salt- and drought-tolerant rootstocks at the CSIRO research station in Merbein, Victoria.

The work of private grapevine breeders should also be acknowledged here. A devoted group of breeders in the U.S. midwest, led by the late Elmer Swenson, has been breeding for winter-hardiness and disease tolerance.

In 2007, I had the good fortune to meet Lucian Dressel, another private grape breeder. He has used the remarkable American grape Norton as a parent in his program. Norton is tolerant to all fungal diseases, plus phylloxera and PD, and yet makes the best wine of all the American vines.

Dressel has crossed Norton with several vinifera varieties, including Cabernet Sauvignon and Zinfandel. He has registered the names Crimson Cabernet, Cabernet Diane, and Zinthiana as new varieties, and commercial evaluation is underway, including in vineyards with PD.

Breeding for climate change

Professor Harold Olmo bred winegrapes for the hot Central Valley of California many years ago, and, in light of forecasts of climate change, this work needs to be resurrected. The world's hot area vineyards in California, Australia, South Africa, and Iberia are particularly threatened. Many suitable parents for such a breeding program are available in Spain and Portugal, and I think that an international effort should be started to develop heat-tolerant new varieties.

Sadly, Australia will not be able to pull its weight in this effort, as the government has just decided to close the Merbein CSIRO Research Station, home of Australia's grape breeding program. (So much for the greatly applauded Australian grape and wine research program!)

Conclusion

Nay-sayers will contend that new hybrid varieties will never be important, but there are many arguments against this. Don't forget that Cabernet Sauvignon is a so-called new variety, being a "natural cross" of Sauvignon Blanc and Cabernet Franc! Also Chardonnay was a new variety 35 years ago!

I think that imaginative grape variety naming, as illustrated by Lucien Dressel and Geneva Experiment Station (Chardonel and Traminette being examples), will help overcome market resistance, as will good marketing.

Friends in wine, our future survival may depend on these breeding efforts, may they long continue! ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Launceston, Tasmania, in Australia. He can be contacted by e-mail: vinedoc@bigpond.net.au. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/ 838-6312 and http://www.vinquiry.com.

Electrodialysis

Continued from page 55

cut energy use from 1,200 to 22 Wh per gallon. A comparison of electrodialysis and the two cold stabilization tests is shown in Table II.

Incorporating study results

The two PG&E studies show that electrodialysis is the clear energy-efficiency winner for the clarification process. However, the studies also show that making modest changes to the cold stabilization process can significantly increase efficiency for this commonly used method.

Since insulation potentially accounts for the majority of cold stabilization energy savings, winemakers are encouraged to insulate tanks. In fact, according to a PG&E Non-Residential New Construction study prepared by Applied Technology Services, simply installing three inches of insulation around tanks can cut energy use by almost 95%. This supports the dramatic drop in electricity — from 1,200 to 22 Wh per gallon — between the two test sites in the Emerging Technologies studies.

In addition to energy savings, electrodialysis offers the benefits of less processing time and reduced wine loss. Although these benefits go beyond the scope of the study, winemakers are reminded to take these into consideration when weighing the pros and cons of adopting electrodialysis technology. Other considerations such as space, time, and winemaking style must be taken into account.

The nuances and long-term plans of each winery will influence the most appropriate method. Winemakers must be especially aware that adopting electrodialysis technology results in increased water consumption that necessitates increased wastewater treatment and associated costs.

Fetzer Vineyards was in a unique position in that they already employed multiple water conservation methods and it was therefore easy to accommodate extra waste water. Winemakers who do not have this capability must be prepared for increased water-related expenses. To that end, PG&E will conduct a study in which winery wastewater treatment practices will be examined and benchmarked.

"We are aware that electrodialysis uses more water than traditional stabilization," says Fetzer's Thrupp. "However, the relatively small increase in water for this technology is addressed and compensated for by ongoing water conservation practices throughout the winery, bottling facility, and vineyards. In addition, the water is treated on-site through aeration ponds and is reused in the vineyards and landscaping."

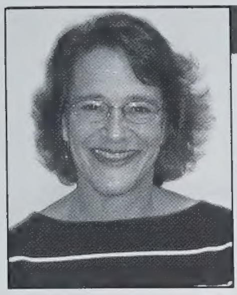
PG&E supports the adoption of electrodialysis technology for wine stabilization as an energy efficiency tool, and encourages winemakers to insulate tanks to save energy in the cold stabilization process. To that end, PG&E is currently offering incentives for adopting non-mobile electrodialysis technology or for insulating wine tanks.

To find out how PG&E can evaluate your possible energy savings using electrodialysis technologies, call the PG&E Business Customer Service Center (800/468-4743) and ask for the project manager in your area. ■

[Steve Fok, PE, has been managing power generation, environmental compliance, and energy efficiency projects at PG&E for 29 years. Steve can be reached at 415/223-4735 or SKF2@pge.com.]

EDITOR'S NOTE

If you have queries on the text, "Oxygen ingress into bottled wine" (page 6, July/August 2008 ***PWV Journal***), you can contact authors by email: George Skouroumounis, Senior Research chemist in Oenology, University of Adelaide, School of Agriculture, Food and Wine: George.Skouroumounis@adelaide.edu.au **OR** Elizabeth Waters, Research Manager - Biochemistry, Australian Wine Research Institute: elizabeth.waters@awri.com.au **OR** send queries to: Editor@practicalwinery.com



PERSONNEL POINT OF VIEW *by Shelley Brott*

Leadership in action

What does it take to be an exceptional leader in today's business environment? During more than 25 years in the human resources field, I've worked with, observed, and consulted with a great many supervisors and managers. I've also had the opportunity to work with a much smaller number of people I think of as truly exceptional leaders.

Leaders can have a tremendous impact on their teams and businesses. They affect every aspect of the bottom line — including employee motivation and retention, customer relationships, and business performance, to name a few. In this context, the developing leadership skills can be seen as a key business strategy.

But what exactly is leadership? How does it differ from supervision or management? These terms are often used interchangeably, but they are actually quite different. Management is the ability to work with and through others to accomplish organizational goals. Leadership is the ability to influence the behavior of an individual or group. Influence. That is the key word here.

Theodore Roosevelt described the difference between leaders and managers this way: "People ask the difference between a leader and a boss. The leader leads and the boss drives." Think about that.

What picture does it bring to mind? For the leader, I see the Pied Piper, with motivated, eager employees dancing behind him or her.

For the boss, I see two different images. First, I envision a manager behind his employees, pushing them along. Second, I see a manager literally "driving" a car in her chosen direction. Where are her employees? I see them in the back seat.

Do you have to be a manager to be a leader? I don't think so. We probably all know non-management employees who are seen as leaders by their managers and co-workers. They achieve this distinction not by title but by their actions. That is leadership in action.

As we reflect on leadership, and what it takes to be an excellent leader, it can be helpful to think about people we consider to be true leaders, and why we think so. Those people might be famous leaders from our history books. They might be people we have worked with and for. Or, they might be our old friend, Dorothy Gale.

Do you remember Dorothy — from the Wizard of Oz? I recently came across some interesting articles using Dorothy as an example of leadership. Think about it. What made Dorothy successful at leading her diverse team? I think of things like a clear vision, a defined path (yellow brick of course), a positive approach, willingness to take on difficult issues, and compassion.

Various models have been introduced over the years to describe effective leadership and help us develop leadership skills. I have a leadership model, which I call "Leadership in Action." Six action steps provide a path to effective leadership development. Take a moment to think about yourself as a leader and assess your leadership skills. What do you see as your strengths? What are your development needs?

The **first requirement** of the "Leadership in Action Model" is to understand and develop yourself. Getting a management title doesn't make you a leader. You have to choose to be a leader and to accept and embrace your leadership role.

Excellent leaders are constantly seeking to develop themselves, including assessing their own skills and styles. They work to expand their capabilities, to build on their strengths, and to let go of old habits. They know themselves and exhibit self-discipline when it matters. Great leaders are decisive, but are also willing to ask for help.

The **second element** instructs us to point to the future. To me that statement implies both direction and action. Exceptional leaders communicate a clear vision and direction. They share goals and expectations with their people and are clear about priorities. They pay attention to what is happening around them and follow through with their commitments. These leaders act with determination, perseverance, and optimism. They are problem solvers and decision makers.

The **third step** is to be a role model. You have probably heard this before, but it bears repeating. True leaders "talk the talk," and they also "walk the talk." They pay attention to their own behaviors and hold themselves accountable. They exhibit good judgment, integrity, compassion, and honesty. They admit their mistakes and give credit where it is due.

The **fourth key component** is to lead to the individual. Exceptional leaders know and understand their employees. They appropriately align employees and positions. They manage, motivate, and support each individual employee.

They develop employee capabilities, and take the time (including face time) to interact with them on a regular basis. These leaders do what it takes to empower employee performance and then recognize accomplishments. They communicate effectively and then communicate some more.

The **fifth element** is that exceptional leaders also stress relationships. They foster teamwork in their own area of responsibility and also across the organization. They build internal and external coalitions. They serve as mentors to others and also reach out to others to be mentored themselves. They keep a "360-degree" outlook, building relationships at all levels and in all directions.

The **sixth element** is to be a change agent. Excellent leaders embrace change and look for opportunities to make change happen. They question the status quo. They understand, manage, and support their own personal reactions to change. And, they know how to support their people and their organizations through times of change, especially when those times are difficult.

How do you measure up to the "Leadership in Action" model? I encourage you to think about your personal development plan. Build on your strengths, and work on your development areas. See if you can become a true leader in action.

How do you know you've succeeded at becoming a leader? John Quincy Adams said it best: "If your actions inspire others to dream more, learn more, do more, and become more, you are a leader. ■

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